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CONTENTS.

	PAGE
Hygiene. By Dr. Carpenter	385
Easy Steps in Trigonometry. By Rev. A. D. Capel, M.A.	387
Typical Schools which I have Examined. By an Inspector of Schools	392
The Elements of Mental and Moral Science as applied to Teaching. By J. Adams, M.A.	395
Animal Physiology. By Arthur Newsholme, M.D., C.S.S.	398
Music.—'Milking Time'	400
Answers to Certificate Examination Papers	401
Query Column	413
Notes of a Lesson on Movements of the Air. By Jos. H. Cowham, F.G.S.	417
Lectures on Shakspere's 'King Lear.' By H. Marmaduke Hewitt, M.A., LL.M. ...	418
Alfred Carpenter, Esq., M.D., J.P., &c., &c.	422
Publications Received	422
Sale and Exchange Column	423
Publications Reviewed	424

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Hygiene.

BY ALFRED CARPENTER, M.D., M.R.C.P. (LOND.).

HOW TO PREVENT DISEASE IN SCHOOL AND HOME (*continued.*)

Relapsing Fever (*continued*).—Dr. Obermier showed us that the organisms disappeared as the fever subsided and reappeared when a relapse took place. Dr. Cohn proved that these organisms were spirillæ belonging to the natural order *Schizosporeæ*. Another eminent botanist, Dr. Von Naegeli, has styled them *Schizomycetes*, connecting them both with the Algæ as well as the Fungi, and leaving no doubt as to their Botanical characteristics. The spirillæ are always present during the hot stage of the Fever, their growth and development being intimately associated with the production of a high temperature in the blood. They can be kept alive for a short time out of the body, and they can be made to propagate the disease. The contagiousness of the Fever, the tendency to recur which its name indicates, and the coincidence of living organisms pathognomonic of the disease, have been clearly established. It seems as if the rise of temperature might be caused by conditions similar to that which follows during the germination of ordinary seeds. The symptoms and effects of relapsing fever throw a flood of light upon the conditions which attend upon all classes of enthetic disease, from plague and cholera at one end of the list to simple ague at the other. The rules as to hygienic treatment of relapsing fever correspond in every important point with those which have to be followed when treating a case of typhus. It is not quite so subtle in its attacks, and is in consequence more capable of control, especially as we do not in this country have the conditions of famine extending in a general way, but in those parts of the world in which famine is an intense reality, the disease exerts its powers, and produces its mortality as was its wont in this country in times gone by. In the early part of this century it was the scourge of Ireland, spreading from its hot beds in the shanties of the more degraded occupiers of the land, to the better class houses, and bringing its punishment on the heads of those who were responsible for the misery of the poor wretches in whose hovels the germs of the disease were preserved, and when times favoured their reproduction, it was reproduced with vengeance in its sting.

The etiology of the disease being so manifest, its prevention is comparatively easy if the right means are adopted. Sunlight, fresh air, and cleanliness, with good food, are fatal to its continued manifestation. The germs for its development are thrown off by the skin and the breath, the perspiration swarms with the micro-organisms which infest the clothes, and all kinds of fomites may convey them to any distance, provided the temperature is at a normal state as far as this genus is concerned. If the cases are treated as will be directed for cholera, there will be no recurrence of the disease.

There is a disease which is styled *Dengue*, which occurs in many parts of the world, and which from the rapidity of intercourse which is now possible is sometimes reproduced in this country. It is an infectious eruptive fever, sudden in its attack, remitting in two or three days, the patient then relapsing, going on for some time with a variety of symptoms which ally it with intermittent fever, with scarlatina, with typhoid, and typhus, so that a doctor who has never seen it is in doubt as to the nature of the complaint he is called upon to treat. There is intense headache, intolerance of light, with swellings and pain in the muscles and joints, which pains suddenly shift from place to place; there may be swollen lingual glands, sore throat with skin eruption on the third day. The malady is sometimes called German Measles, because it is neither like to true scarlatina or true measles or typhus, it may be a combination of papules, vesicles and pustules. There is also great prostration and general debility, so that the patient's life appears in great danger, but the disease suddenly subsides; it is not attended with fatal results in this country, but convalescence is very tedious. It is likely to become more and more general as intercourse with the places of its birth is more and more rapid and frequent. Fomites in the shape of hangings, garments, and furniture are brought

from Thibet, China, Burmah, parts of Africa, and the West Indies, without being disinfected, and doubtless the germs of this disease, like to those of relapsing fever, may be preserved in such articles, and may infect those who are susceptible and who may be brought into contact with the living organisms, which the breath or perspiration of the patient may have left upon them in the country of their production. Fashion, by inculcating a taste for articles of foreign manufacture, is also spreading diseases of this character into households of all classes, reproducing their specimens of such diseases at unexpected moments, and in unexpected places, and thus agree in making mankind a complete brotherhood. The conditions which are required for the suppression of *Dengue* are precisely the same as those for relapsing fever, combined with those for scarlatina. The name of Dengue is probably derived from the Spanish language; it is an uncomfortable name. The term German measles is sometimes used for it, neither are convenient. I would suggest the term *Dengutina* which shows its origin and alliances.

Cerebro-Spinal Fever.—This fever is one which is little known, and yet is more common than supposed, it is probably registered (when a fatal result follows its incidence) under the name of Typhoid fever, though the absence of enteric symptons evidently removes it from that class of disease. It is not so infective as to lead to its epidemic appearance in given districts in this kingdom, but it is epidemic in some countries, and must not be altogether passed over. Like to *Dengutina* it is more prevalent now that intercourse with foreign countries is so much more general than it used to be. It is a specific infectious fever characterised by congestion of the membranes of the brain and spinal cord. The symptoms are such as these lesions will produce, and it is not uncommon in sea ports for it to cause collapse and early death. There may be premonitory symptoms such as malaise, headache, &c., but the more usual commencement is with rigor, intense headache, persistent vomiting, pains in muscles, cramps, delirium, delusions with spinal contortions, drowsiness, purpuric eruptions on skin, and there is a large mortality. It should be treated hygienically, precisely as is recommended for typhus fever.

Yellow Fever sometimes makes its appearance at sea ports in this country. It is not unknown at Cardiff when vessels arrive direct from the West Indies. It is in true parlance a fæcal disease, and closely connected with fæcal blood poisoning. When it developes it is because the nest has been fouled, and the ship itself in which the case has been hatched is soaked with poison. It does not establish itself as an epidemic disease in this country, because the conditions required for its manifestation do not arise, though it is possible that such a contingency might be present. Given a ship soaked with fæcal bilge water, hailing from a port at which yellow fever is rife, arriving in this country when temperature is and has been very high for some time, there may be a serious epidemic before the cause of the mischief is suspected. Quarantine in such a case in its definite sense is necessary, so that intercourse shall cease between those engaged in nursing the sick and the rest of the population, those on board the infected ship and who are not ill should be removed as quickly as possible to a place of safety. If the disease should appear in a set of buildings on shore, those who are well should evacuate the place, whilst the sick should be in strict quarantine, fumigations being carried on without stint, and all the evacuations from the patient destroyed by powerful disinfectants, especially by nitrous acid, or sulphuric acid fumes. If possible the patients should be kept in the open air or under such coverings as will only protect them from heat of sun or rain without allowing the possibility of harbouring the cause of the disease.

Quarantine as a rule is absolutely powerless to prevent the extension of enthetic disease, but in the case of yellow fever it is permissible because it can be made effective until the elements give the protection which this country possesses in its lower average temperature. If there be a cargo on board an infected ship it should be thoroughly fumigated with Chlorine or Nitrous acid fumes before any portion of it is landed. I will again refer to Quarantine at a later period.

The Plague.—The reasons which prevent the development of yellow fever in this country also save us from the incidence of the plague. It has been endemic in Egypt from time immemorial, but the sanitary regulations which have been introduced with the English army of occupation are banishing this terrible disease from that country. It spreads occasionally in Spain in consequence of the dirty habits of the people, and it decimates the Turkish dominions at irregular intervals. The bubo plague as it is popularly called is easily preventable and its presence is a disgrace to any country. It is caused by filthy habits and is absolutely destroyed by cleanliness.

Typhoid or enteric fever.—This, like to yellow fever is essentially a fæcal fever, and has its rise in a sewage sodden soil. It is of animal origin, and is distinctly associated with the intestinal discharges of persons who are sick of the disease. It is possible that a single case in a particular district, may be an imported one, and not due to the locality in which the patient happens to be when overtaken by the disease, but if there be a slight sprinkling of cases about a given locality it is pretty certain that something is wrong with its sanitary state. It may be propagated by cases which are called *ambulatory* typhoid, because the patient suffers from chronic diarhœa only, and is not so ill as to compel him to keep his bed. A whole line of sewer which is badly designed and which does not flush clean may be infected by one of these cases and propagate the disease in the whole of the district. It is very important therefore for a local authority to obtain the earliest possible intimation of the presence of such a case in their midst, so that special care may be taken to disinfect the sewer into which such fæcal evacuations are passing. It is especially in connection with this disease that notification becomes a public duty and all persons who are affected should either by themselves or their agents give notice to the Sanitary Authority that they are suffering from that disease. The duty of notifying will be dealt with when the whole subject is considered, in connection with that of Quarantine; I merely mention here that it is especially necessary in the case of Typhoid, of Cholera, and all the class of fæcal fevers. It is important that the disease should be recognised in its early stages, because persons continue to go about suffering from its effects, often without knowing the nature of the complaint under which they are

labouring, and by so doing placing their lives in jeopardy as well as endangering others by infecting all the places that they may visit, through the sewage deposits. A first attack preserves in a great measure from a second, so that there are generally some in a district who are proof against its effects; it is also not infectious in the same way as small pox and scarlet fever is catching, indeed the chances of infection if ordinary cleanliness is used, and the nurses do not feed in the wards of their patients or eat with unwashed hands is all but '*nil.*' It is possible for cases to be admitted into the General Hospitals without any danger to other patients, though some persons are so afraid of contagion that they would prohibit the reception of such cases into a General Hospital under any circumstances. There is no occasion whatever for this fear. Typhoid or Enteric Fever is not infectious in the same sense as Scarlatina or Measles, and single cases need not be put in quarantine, but it would be very imprudent to fill an ordinary ward with such cases because they certainly require larger floor space and more ventilation than would be necessary for bronchitis, pneumonia or other lung affections. So that if an epidemic should show itself it would be necessary for cases to be treated in the infectious wards which every populous district ought to possess.

The symptoms of Typhoid or Enteric Fever are sometimes slight for a long time, at others they are ushered in with considerable severity. Rigors, pains in the limbs and stomach, sickness, followed by diarrhœa uncontrolled by moderate means, with loss of strength, and considerable thirst, tell their own tale; but when there is simple weakness, loss of appetite and looseness of bowels with loss of flesh it is not always so clear. If in such cases there should be any doubt, it can be cleared up by the use of the clinical thermometer.

(To be continued.)

—o—

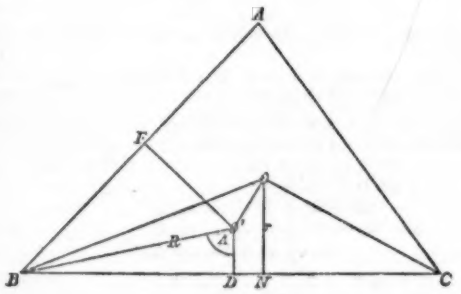
Easy Steps in Trigonometry.

BY REV. A. D. CAPEL, M.A.,

Author of 'Catch Questions in Arithmetic,' etc., etc.

ANSWERS AND HINTS TO SOLUTIONS.

CHAPTER XII.



1. Let ABC be a triangle and let O be the centre of the Inscribed and O_1 that of the Described circle:

$$\therefore O_1B = R;\quad OB = r \operatorname{cosec}\frac{B}{2}$$

$$\therefore OO_1^2 = R^2 + r^2\operatorname{cosec}^2\frac{B}{2} - 2Rr\operatorname{cosec}\frac{B}{2}\cos OBO_1$$

$$\text{but } OBO_1 = \frac{B}{2} - O_1BD$$

$$= \frac{B}{2} - \frac{\pi}{2} + A$$

$$= \frac{B}{2} - \frac{A}{2} - \frac{B}{2} - \frac{C}{2} + A$$

$$= \frac{A}{2} - \frac{C}{2}$$

$$\therefore OO_1^2 = R^2 + r^2\operatorname{cosec}^2\frac{B}{2} - 2Rr\operatorname{cosec}\frac{B}{2}.\cos\left(\frac{A-C}{2}\right)$$

$$= R^2 - 2Rr\left(\operatorname{cosec}\frac{B}{2}.\cos\frac{A-C}{2} - \frac{r\operatorname{cosec}^2\frac{B}{2}}{2R}\right)$$

$$\text{but } \operatorname{cosec}\frac{B}{2}.\cos\frac{A-C}{2} - \frac{r\operatorname{cosec}^2\frac{B}{2}}{2R}$$

$$= \frac{\cos\frac{A}{2}.\cos\frac{C}{2} + \sin\frac{A}{2}\sin\frac{C}{2}}{\sin\frac{B}{2}} - \frac{r\operatorname{cosec}\frac{B}{2}}{2R.\sin\frac{B}{2}}$$

$$\text{and } \frac{r\operatorname{cosec}\frac{B}{2}}{2R} = \frac{\frac{S}{s}}{\frac{abc}{2S}}.\sqrt{\frac{ac}{(s-a)(s-c)}}$$

$$= \frac{2(s-a)(s-b)(s-c)}{b\sqrt{ac}\sqrt{(s-a)(s-c)}} = 2\sqrt{\frac{\sqrt{s-a}\sqrt{s-b}}{ab}\frac{\sqrt{s-b}\sqrt{s-c}}{bc}}$$

$$= 2\sin\frac{C}{2}.\sin\frac{A}{2}$$

$$\therefore OO_1^2 = R^2 - \frac{2Rr}{\sin\frac{B}{2}}\left(\cos\frac{A}{2}.\cos\frac{C}{2} + \sin\frac{A}{2}.\sin\frac{C}{2} - 2\sin\frac{A}{2}.\sin\frac{C}{2}\right)$$

$$= R^2 - 2Rr\left(\frac{\cos\frac{A+C}{2}}{\cos\frac{A+C}{2}}\right)$$

$$= R^2 - 2Rr.$$

2. The Student must draw a figure. Let ABC be the triangle, and let AB, AC be produced to D and E, and let the circles, whose radii are r and r_a be drawn. Let O be the centre of the Inscribed circle and Q that of the Escribed circle. Then AOQ is a straight line

$$\text{and } OQ = AQ - AO$$

$$= \operatorname{cosec}\frac{A}{2}\left(r_a - r\right)$$

$$= \operatorname{cosec}\frac{A}{2}\left(\frac{S}{s-a} - \frac{S}{s}\right)$$

$$= S\sqrt{\frac{bc}{(s-b)(s-c)}}.\frac{a}{s(s-a)}$$

$$= a\sqrt{\frac{bc}{s(s-a)}}$$

$$= a\sec\frac{A}{2}.$$

3. If OCQB be joined it forms a quadrilateral of which the opposite angles are together = two right angles.

4. The radius is $\frac{1}{2}$ OQ the diameter or $(\sec 2)\ \frac{a}{2}\ \sec\frac{A}{2}$.

5. $AF = r \cot \frac{A}{2} = \frac{S}{s}\sqrt{\frac{s(s-a)}{(s-b)(s-c)}}$

$= \frac{S}{s}\sqrt{\frac{s(s-a)\,s(s-a)}{s(s-a)(s-b)(s-c)}}$

$= s - a.$

or otherwise.

AF = AE (E where Inscribed circle touches AC), and CE = CD (D where circle touches BC), and BD = BF

$\therefore$ AF + BD + CE = half perimeter or s.

$\therefore$ AF = s − (BD + CE) or s − a (since CD = CE).

6. Let Q be the centre of Escribed circle, $AG = r_a \cot \frac{A}{2}$

$= \frac{S}{s-a}\sqrt{\frac{s(s-a)}{(s-b)(s-c)}}$

$= s.$

7. Using the same letters as in 5.

$c = AF + FB$

$= r \cot \frac{A}{2} + r \cot \frac{B}{2} = \&c.$

8. Since $R = \frac{abc}{4S} = \frac{c}{2 \sin C}$ $\therefore c = 2R \sin C.$

9. $\therefore 2R \sin C = c = r\left\{\frac{\cos\frac{A}{2}}{\sin\frac{A}{2}} + \frac{\cos\frac{B}{2}}{\sin\frac{B}{2}}\right\}$

$= r\left\{\frac{\sin\frac{A+B}{2}}{\sin\frac{A}{2}.\sin\frac{B}{2}}\right\}$

10. Since $\sin\frac{A+B}{2} = \cos\frac{C}{2}$, and $\sin C = 2\sin\frac{C}{2}.\cos\frac{C}{2}$

$\therefore$ 9 becomes $4R \sin\frac{C}{2} = r\frac{1}{\sin\frac{A}{2}.\sin\frac{B}{2}} = \&c.$

11. This deduces immediately from 10.

12. Using the same letters as in 5 and 6.

a = BH (H being the point where Escribed circle touches BC) + HC $= r_a\left(\tan\frac{B}{2} + \tan\frac{C}{2}\right)$, since OBC and QBC are complementary to each other.

13. Adopt the method of Examples 8 and following.

14. Use Form. 38, 39, and 40.

15. $2R = \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

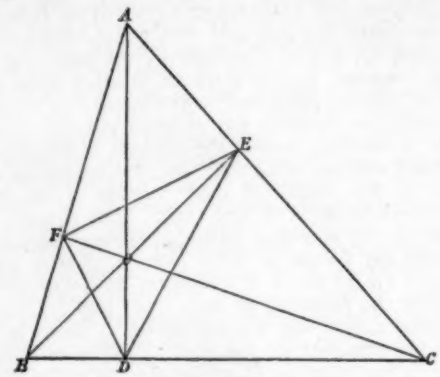
$\therefore 2R = \frac{a+b+c}{\sin A + \sin B + \sin C}$

and the denominator by Form. B and 6

$= 4\cos\frac{A}{2}.\cos\frac{B}{2}.\cos\frac{C}{2}.$

$\therefore$ &c.

16.



The triangles AEO and ADC are similar

$\therefore \frac{AO}{AE} = \frac{b}{AD}$ and $AE = c \cos A$

$\therefore AO = \frac{bc\cos A}{AD}$ and $AD = b \sin C$

$\therefore AO = \frac{c\cos A}{\sin C} = 2.\frac{c}{2\sin C}.\cos A$

$= 2R \cos A.$

17. See Figure to 16.

$EF^2 = AF^2 + AE^2 - 2AF.AE.\cos A.$ Form. 30.

$= b^2\cos^2 A + c^2\cos^2 A - 2bc\cos^2 A.\cos A$

$= \cos^2 A\,(b^2 + c^2 - 2bc\cos A)$

$= \cos^2 A.\,a^2$

$\therefore EF = a\cos A = \frac{2a\sin A.\cos A}{2\sin A}$

$= R.\sin 2A$

$\therefore R(EF + FD + DE) = R^2(\sin 2A + \sin 2B + \sin 2C)$

$= 2R^2[\sin(A+B)\cos(A-B) - \sin(A+B)\cos(A+B)]$

$= 4R^2 \sin C \sin A \sin B$

$\therefore \frac{1}{2}R(EF + FD + DE) = \frac{2bc\sin C.\sin A.\sin B}{2\sin B.2\sin C}$

$= \frac{1}{2}bc\sin A = S.$

18. $\frac{1}{r} = \frac{s}{S}$

$\frac{1}{r_a} + \frac{1}{r_b} + \frac{1}{r_c} = \frac{1}{S}(s - a + s - b + s - c)$

$= \frac{s}{S}$

$\therefore \frac{1}{r} = \frac{1}{r_a} + \frac{1}{r_b} + \frac{1}{r_c}$

19. Draw a figure; let AB = a, BC = b, CD = c, and DA = d.

Area of quad. $= \frac{1}{2}ab\sin B + \frac{1}{2}cd\sin D$

but $\sin B = \sin D$

$\therefore$ area $= \frac{1}{2}\sin B\,(ab + cd)$

similarly area $= \frac{1}{2}\sin A\,(ad + bc)$

$\therefore \frac{\sin A}{\sin B} = \frac{ab + cd}{ad + bc}$

$BD^2 = a^2 + d^2 - 2ad\cos A$

also $BD^2 = b^2 + c^2 - 2bc\cos C$

$= b^2 + c^2 + 2bc\cos A$

$\therefore 2\cos A = \frac{a^2 + d^2 - b^2 - c^2}{ad + bc}$

$\therefore BD^2 = \frac{(ac + bd)(ab + cd)}{ad + bc}$

similarly $AC^2 = \frac{(ac + bd)(ad + bc)}{ab + cd}$

$\therefore \frac{BD^2}{AC^2} = \frac{(ab + cd)^2}{(ad + bc)^2}$

$\therefore \frac{\sin A}{\sin B} = \frac{BD}{AC}$ $\therefore$ &c.

20. If r_a, r_b, r_c are in A. P.

$$\frac{S}{s - b} = \frac{S}{2}\left(\frac{1}{s - a} + \frac{1}{s - b}\right);$$

but if the tangents of the half angles are in A. P., we get the same equality. $\therefore$ &c.

21. $\frac{1}{p_1} + \frac{1}{p_2} + \frac{1}{p_3} = \frac{1}{c \sin B} + \frac{1}{a \sin C} + \frac{1}{b \sin A}$

$= \frac{1}{2S}(a + b + c)$

$= \frac{s}{S} = \frac{1}{r}$.

22. $\frac{1}{r_a} + \frac{1}{r_b} + \frac{1}{r_c} = \frac{1}{S}(s - a + s - b + s - c)$

$= \frac{s}{S} = \frac{1}{p_1} + \frac{1}{p_2} + \frac{1}{p_3}$

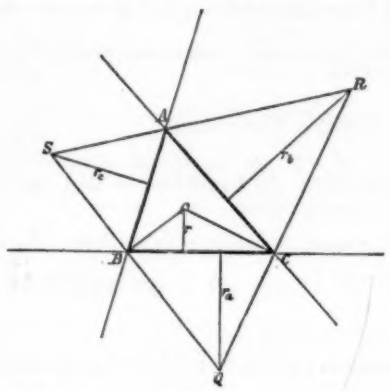
23. $p_1, p_2, p_3 = abc \sin A \sin B \sin C$

$= 8abc \frac{S^3}{a^2 b^2 c^2}$

$= \frac{2^3 (a + b + c)^3 S^3}{abc.(a + b + c)^3}$

$= \frac{(a + b + c)^3 r^3}{abc}$

24.



Let QRS be the centres of the circles whose radii are r_a, r_b, r^c respectively. Then QR passes through C, RS through A, and SQ through B, since the segments RC and CQ, &c., are each at right angles to the lines which join C, &c., with the centre of the Inscribed circle

$$RC + CQ \text{ or } RQ = \sec\frac{C}{2}(r_a + r_b)$$

$$\text{similarly } SQ = \sec\frac{B}{2}(r_c + r_a).$$

The angles RQS and COB are together = 180°

but $COB + \frac{B}{2} + \frac{C}{2}$ are also together = 180°

$\therefore RQS = \frac{B + C}{2}$

and $\sin\frac{B + C}{2} = \cos\frac{A}{2}$.

$\therefore$ area of $QRS = \frac{1}{2}\sec\frac{C}{2}(r_a + r_b)\sec\frac{B}{2}(r_c + r_a).\cos\frac{A}{2}$

which by Form. 33, 40, and 39 will reduce to $\frac{abc}{2r}$.

25. $OA^2 = r^2 \operatorname{cosec}^2\frac{A}{2}$ $\therefore$ a $OA^2 = ar^2 \operatorname{cosec}^2\frac{A}{2}$

$\therefore$ L.H.M. $= r^2\left\{\frac{a}{\sin^2\frac{A}{2}} + \frac{b}{\sin^2\frac{B}{2}} = \frac{c}{\sin^2\frac{C}{2}}\right\}$

which by Form. 39 and 34 will reduce to $\frac{S^2}{s}$ abc $\frac{s}{S^2}$ or abc.

CHAPTER XIII.

USE OF LOGARITHMS AND SOLUTION OF TRIANGLES.

177. If $a^x = N$, x is called the logarithm of N with respect to a or to the base a.

178. Since a logarithm is in reality an index, the laws of logarithms are therefore the same as for indices; that is, to multiply quantities expressed by means of logarithms to the same base, we add the logs.; to divide we subtract, to raise to a power we multiply, and to extract a root we divide, but addition and subtraction cannot be performed by logarithms.

179. $10^2 = 100$

$10^3 = 1000$

$\therefore$ the logs. of all numbers between 100 and 1000 are greater than 2 and less than 3. This fractional part, or mantissa as it is called, is to be found in tables.

e.g. $200 = 10^{2{\cdot}30103}$ and $300 = 10^{2{\cdot}47712125}$.

$\therefore$ $60{,}000 = 10^{4{\cdot}77815125}$ a number between 10,000 and 100,000.

180. $\log(N \times 10^n) = \log N + n$

and $\log\left(N \times \frac{1}{10^n}\right) = \log(N \times 10^{-n}) = \log N - n$.

181. If $a^x = b^y$ $\therefore a^{\frac{x}{y}} = b$ and $b^{\frac{y}{x}} = a$

and $\frac{x}{y} = \log_a b$ and $\frac{y}{x} = \log_b a$

$\therefore \frac{x}{y} \times \frac{y}{x}$ or $1 = \log_a b \times \log_b a$

But though this theorem is all important in the finding of logarithms, which is beyond the scope of this chapter, it is seldom, if ever, used in the practical use of logarithms.

182. If we know the logarithm to base 10 of two consecutive numbers as, say, 12345 and 12346, and have only logs. for numbers up to 100,000, we can find approximately the logs. of all numbers $> 12345 \times 10^n$ and $< 12346 \times 10^n$

e.g. Find $\log_{10}$ of 1234567.

If $\log_{10}$ 1234600 = 6·0915263
and $\log_{10}$ 1234500 = 6·0914911
diff. = ·0000352
100 : 67 = ·0000352 : ·0000235
∴ log 1234567 = 6·0915146.

183. $\cdot00002 = \frac{2}{10^5}$

$$\therefore \log_{10}(\cdot00002) = \log 2 - 5 = \bar{5}\cdot30103$$

of which the student must notice that only the integral part or characteristic, as it is called, is negative, the mantissa being always positive.

Note.—The characteristic is greater by one than the number of cyphers before the 1st significant figure.

184. To find the 6th root of ·00002, we work as follows:—

(*Note.*—log with no suffix means the log to base 10.)

$$\log \cdot00002 = \bar{5}\cdot30103$$
$$\log (\cdot00002)^{\frac{1}{6}} = \tfrac{1}{6}(\bar{5}\cdot30103) = \tfrac{1}{6}(\bar{6} + 1\cdot30103) = \bar{1}\cdot2168383$$

If we look for the nearest number corresponding to this log in the tables we find it to be 16475 ∴ the 6th root of ·00002 is ·16475... which the student can verify by first finding the cube root, and then finding its square root.

185. Since the sines, cosines, tangents, &c., of an angle are abstract numbers, their logs. have been calculated and duly tabulated.

186. Since all sines and cosines and half of the tangents are abstract numbers less than 1, their characteristics are negative; mathematicians have therefore, to save confusion, adopted the plan of adding 10 to the logarithms of these ratios, and these logarithms so increased are called tabular logarithms, and are usually denoted by the symbol L.

187. The student must notice that though sines, tangents, and secants increase as the angle increases from 0° to 90°, cosines, cotangents, and cosecants decrease.

188. If the table gives us the logarithms of these ratios to a certain degree of accuracy, we can, in general, find the logarithms of a known angle, or the angle corresponding to a known logarithm by means of proportional parts, as in par. 182.

189. If the ratio is approaching infinity it is evident the value will increase very rapidly as the angle increases, we must therefore either use some other formula where the ratio changes more slowly or find some method of calculating the amount of error, as produced by assuming the principle of proportional parts, but this is beyond the scope of this present chapter.

190. The solution of triangles may be reduced to the three following cases:—

1st case.—An angle, its opposite side, and one other element.

2nd case.—Two sides and the angle between them.

3rd case.—Three sides.

191. 1st case. The only formula we want is

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c} \ldots \quad \text{Form. 31.}$$

e.g. given A. B. a, solve the triangle

since $\frac{b}{\sin B} = \frac{a}{\sin A}$

$$b = \frac{\sin A}{\sin B} a$$

$$\therefore \log b = L\sin A - L\sin B + \log a$$

Knowing A and B we know C

since C = 180° − A − B

and $\log c = L\sin A - L\sin C + \log a$

hence the triangle is solved.

192. 2nd case. The only Formula we want is

$$\tan \frac{A-B}{2} = \frac{a-b}{a+b} \cot \frac{C}{2}$$

We know a, b, and C

$$\therefore L\tan \frac{A-B}{2} = \log(a-b) - \log(a+b) + L\cot \frac{C}{2}$$

but knowing C we know $\frac{A+B}{2}$

and hence we can find A and B,

and $\frac{c}{\sin C} = \frac{a}{\sin A}$, which will give us C.

193. 3rd case. Three sides.

Since $a^x + a^y$ is not capable of simplification, we cannot therefore use logarithms to find sums and differences, as said above.

An expression therefore of the Form. $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$ (Form. 30) is not adapted for logarithmic computation.

We therefore use one of the following formulas,

viz., $\cos \frac{A}{2} = \sqrt{\frac{s(s-a)}{bc}}$ Form. 33.

or $\sin \frac{A}{2} = \sqrt{\frac{(s-b)(s-c)}{bc}}$ Form. 34.

or $\tan \frac{A}{2} = \sqrt{\frac{(s-b)(s-c)}{s(s-a)}}$

e.g. Find the angle A, if the three sides are a = 125, b = 170, c = 200. We are supposed to have a book of tables s = 247·5. s − b = 77·5 and s − c = 47·5

$$\therefore \sin \frac{A}{2} = \sqrt{\frac{77\cdot5 \times 47\cdot5}{170 \times 200}}$$

$\therefore$ L sin $\frac{A}{2}$ = 10 + $\frac{1}{2}$ [log 77·5 + log 47·5 − log 170 − log 200]

log 77·5	= 1·8893017
log 47·5	= 1·6766936
log (77·5 × 47·5)	= 3·5659953
log 170	= 2·2304489
log 200	= 2·3010300
log (170 × 200)	4·5314789
diff.	= $\bar{1}$·0345164
½ of this	= $\bar{1}$·5172582
adding 10 it becomes	9·5172582
$\therefore$ L sin x	= 9·5172582
But L sin 19° 13′	= 9·5173824
and L sin 19° 12′	= 9·5170198
$\therefore$ diff. for 1′	= 3626
L sin x − L sin 19° 12′	= 2384
3626 : 2384	= 60″ : 39·5″ nearly
$\therefore$ $\frac{A}{2}$	= 19° 12′ 39·5″
and A	= 38° 25′ 19″.

194. EXAMINATION AND EXAMPLES, XIII.

1. If log 2 = ·30102, find log (·002)$^{\frac{1}{3}}$.

2. Find the log of 16 to base 8.

3. Of how many figures does 2^{31} consist? For log see 1.

4. Show how to find the log of 6 from those of 8 and 9.

5. Show how to find the log of ·00125 from that of 2.

6. What logs would you require to know, with which to find that of 22·5.

7. Given A = 60°, B = 50°, and a = 2 feet, show how you would find c.

8. Given a = 25, b = 13, and C = 20°, show how you would find A.

9. Why would it be very unwise to use Form. for tan $\frac{A}{2}$ to find A, if a were nearly = b + c?

10. Given log 123 = ·0899051
and log 124 = ·0934217
Find log 12345.

11. Given L tan 14 . 24′ = 9·4095212
and L tan 14 . 25′ = 9·4100454.
Find L tan 14 . 24 . 37.

12. The logarithmic sines, &c., are only calculated to 44° 60′. Why are no more necessary?

13. Referred to the centre of a circle, what is the radius of the circle if L sin 45° = 9·8494850?

14. If L cos 28° 35′ = 9·9435549
L cos 28° 36′ = 9·9434861
Find L cos 28° 35′ 47″.

15. If sin 30° = 500,000, what is the length of the radius of the circle?

16. Show by a figure that there are two solutions to the triangles of which you know, A = 30°, b = 40°, a = 30°
ABC is a triangle of which C is = 90°.

Solve the following:—

17. Given (a + b) but not a or b and A, find c.

18. With the data of 17, find a.

19. Given (a − b) but not a or b and A, find b.

20. With the data of 19, find C.

21. Prove b = (b + c) cot A tan $\frac{A}{2}$.

22. Prove c = $\frac{c - b}{2 \sin^2 \frac{A}{2}}$

23. Given (a + b) and c, find the area.

24. Given (a − b) and c, find the area.

25. If the perpendicular from C upon the hypothenuse (c) divides it into segments c_a, c_b
prove tan A = $\sqrt{\frac{c - c_a + c_b}{c + c_a - c_b}}$

(*To be continued.*)

—o—

Typical Schools which I have Examined.

By an Inspector of Schools.

—o—

WE next have to deal with a very remarkable mixed and Infants' Board School in an agricultural district in the West of England. Here the master has *made* the school, the Board would have *unmade* it but for his energy and resourcefulness. There are some 120 scholars on the rolls but the average number per cent. in attendance falls below that for the whole of England owing to the laxity of the Board in its use of compulsory powers. Some of the members have been in the habit of employing children not qualified by the law and have therefore themselves set the bad example of breaking it. But the master has in the face of this great difficulty succeeded in not only earning the excellent grant with about 95 per cent. of passes in the ordinary subjects for his standard scholars, and the same grant for the infant class, by carrying out the subjoined syllabus of instruction, but has actually so helped neighbouring teachers by his counsel and by the examination of their schools that 'fair' departments have become 'good' and good ones 'excellent' through his unselfish exertions. Kindergarten methods of teaching Geography and Arithmetic, excellent writing and expressive reading, an Admirable Museum, a School Post Office, Natural History rambles with his Scholars, are special features in his own School. Particulars under some of these heads will be found below. We wish to call particular attention to the very practical and sympathetic letter of Miss Ormerod, our greatest living authority upon Insect Pests in Agriculture.

TIME TABLE — UPPER DEPARTMENT.

TIME.	CLASS.	MONDAY.	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.	REMARKS.
10 to 10.15	1 & 2 3 & 4	Tables Mental Arithmetic	Mental Arithmetic Tables	Tables Mental Arithmetic	Mental Arithmetic Tables	Tables Mental Arithmetic	Registers. — Morning, 10 to 10.10 Afternoon, 2 to 2.10
10.15 to 10.55	1 2 3 4	Arithmetic ,, ,, Reading	English Dictation and Transcribing Arithmetic ,,	Arithmetic ,, ,, Reading	English Dictation and Transcribing Arithmetic ,,	Arithmetic ,, ,, Reading	Girls Sew. — Tuesday, Thursday, Friday, 2.50 to 4.20
10.55 to 11.5	Recreation and Physical Exercises (Playground)						Class 1. — Standards IV., V., VI. and VII.
11.5 to 11.45	1 2 3 4	Arithmetic Transcribing and Dictation Geography Arithmetic	Writing (copy) English ,, Writing (copy)	Arithmetic Transcribing and Dictation Geography Arithmetic	Writing (copy) English ,, Writing (copy)	Mental Arithmetic Transcribing and Dictation Geography Arithmetic	Class 2. — Standard III.
11.45 to 12.20	1 2 3 4	Composition Reading Transcribing and Dictation Transcribing	Reading Writing (copy) ,, Reading	Dictation and Transcribing Reading Transcribing and Dictation Transcribing	Reading Writing (copy) ,, Reading	Composition Reading Transcribing and Dictation ,,	Class 3. — Standard II. Class 4. — Standard I.
12.20	Dismiss						Scripture and Prayers, 9.30 to 10
2 to 2.10	All classes	Tables					
2.10 to 2.50	1 2 3 4	Reading Transcribing Reading Arithmetic	Geography ,, Transcribing Geography	Reading Transcribing Reading Arithmetic	Geography ,, Transcribing Geography	Singing, ½ hour ,, Object Lesson, ½ hour ,,	
2.50 to 3.30	1, 2, 3 4	Arithmetic Reading	Arithmetic ,,	Arithmetic Reading	Arithmetic ,,	Arithmetic ,,	
3.30 to 3.40	Recreation						
3.40 to 4.20	1 2 3 4	Composition Reading Transcribing ,,	——— ——— ——— ———	Transcribing and Dictation Reading Transcribing ,,	——— ——— ——— ———	Transcribing ,, ,, Reading	
4.25	Appoint Home Lessons and Dismiss						

TIME TABLE.—INFANT DEPARTMENT

		MORNING LESSONS					AFTERNOON LESSONS				
		10 to 10.40	10.40 to 10.50	10.50 to 11.20	11.20 to 11.35	11.35 to 12.5	2 to 2.30	2.30 to 2.50	2.50 to 3.20	3.20 to 3.30	3.30 to 4.20
Monday Wednesday Friday	1st Class 2nd Class	Arithmetic and Tables	Recreation and Physical Exercises in Playground	Reading Writing	Form and Colour Lessons (M)	Writing Reading	Kindergarten Exercises.	Conversational Lessons on Common Objects	Reading Writing	Recreation	Sewing.
Tuesday Thursday	1st Class 2nd ,,	Lessons in Number and Money		Writing Reading	Writing Exercises (Master)	Reading Writing			Writing Reading		Object Lesson and Singing.

MEMORANDUM.

Scripture and prayers 9.30 to 10.0.

Registers 10.0 to 10.5, 2.0 to 2.5.

Dismissal at 12.10 and 4.20.

Lessons by Master (M.)

,, Assistant Mistress (A.M.)

Time per week for each class.

	1st.		2nd.	
Reading	$3\frac{11}{12}$	...	$3\frac{5}{12}$	hours
Writing	4	...	$4\frac{1}{4}$	,,
Arithmetic	$3\frac{1}{2}$	...	$3\frac{1}{2}$	,,
Form and Colour	$\frac{1}{2}$	...	$\frac{1}{2}$	,,
Objects	$1\frac{11}{12}$	...	$1\frac{11}{12}$	,,
Kindergarten	$2\frac{1}{2}$	...	$2\frac{1}{2}$	,,
Singing	1	...	1	,,
Sewing	$2\frac{3}{4}$	...	$2\frac{3}{4}$	,,
Recreation and physical exercises	$1\frac{3}{4}$	...	$1\frac{3}{4}$	,,
	$22\frac{1}{12}$ hours.			

SYLLABUS.—INFANT DEPARTMENT.

	ARITHMETIC.	READING.	WRITING.	FORM.	COLOUR.
THREE & FOUR YEARS.	(*a*) Count to 10. (*b*) Add and subtract mentally up to 6, by means of dominoes, bricks, and sticks.	(*a*) Name and recognize small letters from reading sheet or letter stand. (*b*) Easy words from lesson sheet.	(*a*) Strokes and turns of one height *l i t l* (*b*) Letters of one height as— *m n i u a o e c*	(*a*) Recognise and match square, oblong, circle, triangle, semi-circle.	(*a*) Recognise, match, and name red, blue, yellow, green, orange.
FIVE YEARS.	(*a*) Count to 40. (*b*) Add and substract mentally up to 10, by means of dominoes, beads, cubes, sticks. (*c*) Easy addition as 24 / 32 / 43	(*a*) Jarrold's reading sheet, first 14 lessons. (*b*) Spell easy words from same. (*c*) Know value of full stop.	(*a*) Write letters *i u m n h p g y t l a d o e c v w.* (*b*) Capitals *I J T A M C* (*c*) Easy combinations of the above.	(*a*) Same as above, with addition of oval and crescent. (*b*) Name articles of same shape.	(*a*) Recognise, match, and name 2 shades of red, blue, yellow, purple, brown, green. (*b*) Name things of same colour.
SIX YEARS.	(*a*) Numeration and notation up to hundreds. (*b*) Addition and subtraction without borrowing. (*c*) Multiplication table to 4 × 12. (*d*) Mental Arithmetic to 20. Money to 1*s.*	(*a*) Cassell's primer. (*b*) Spell easy words from same. (*c*) Know value of full stop and comma.	(*a*) Small letters. (*b*) Capital letters *I J T A M C O S D E F G.* (*c*) Combinations of above.	(*a*) Same as above, with addition of pentagon, ring, sphere, cylinder, cube.	(*a*) Recognise, match, and name 3 shades of red, blue, yellow, purple, green. brown. (*b*) Name things that are of same colour.

Needlework Three and Four Years. Position Drill (Needle).
,, Five Years. Needle and Knitting Pin Drill—Hemming a Strip.
,, Six Years. Hemming and Knitting.

POST OFFICE.

A box is placed in a prominent part of the school-room bearing the inscription, 'School Post Office.' It is furnished with a lock and key, only the postman having access to it.

The letters, which are contributed *voluntarily* by the scholars, are posted every week on Monday mornings by the children who write them, and during the dinner hour the box is emptied of its contents, which are placed on the head master's desk by the postman or postmistress. This appointment is made every week, and is a reward for attention and good conduct during the past week. The letters are corrected in red ink, re-directed and placed in the box, the person appointed opening the letter box each day and delivering them to their proper owners.

It is a very popular institution and is greatly valued by the parents, many of the letters finding their way to friends.

The average number of letters posted during the last 12 months has been 23.

NATURAL HISTORY.

(Memorandum by the Master.)

The idea of taking up this branch of study was first suggested to me by some of the boys. I had a private collection of butterflies and moths, but had not introduced them into school. The Rev. J. G. Wood's 'Common objects of the Country,' which was in the school library, led them to suggest the subject. I promised to assist them in adding to our school museum if they would do the collecting. Every child became a collector. The first collection was the caterpillar stage. (I took this step because the greater number of children, and parents too, I found did not know what a caterpillar was. To the rustic mind May flies are caterpillars; caterpillars are 'worms.') I found a few caterpillars, showed them to the children and explained what they were and how they lived, &c. By the end of the week I had as many larvæ as the most ardent naturalist could wish, and all common ones such as Drinker, Tiger Moth. Each collector was to pay particular attention to the food plant on which the insect was found. These were kept in school and the children had an opportunity of seeing the change to the pupa and imago stages.

On knowing the next stage I told them how a great number of specimens might be found in the ground, and they began to find these.

My next step was the collection of butterflies and moths, this I undertook myself owing to the difficulty of capturing, killing, and setting insects without spoiling them.

The elder children go with me on these expeditions some three or four at a time, and very enjoyable walks they are. We still keep on collecting, even the babies being interested and bringing their quota. Nothing is discarded before the children, but is made to serve for a short chat, in the presence of the whole school, with the child who brought it.

We a little time back commenced to study injurious farm insects, on the same plan of finding grubs and maggots, &c., and hope to hold an examination every year in the subject.

I enclose a letter received from the consulting Entomologist to the Royal Agricultural Society. I told her the plan I had adopted and asked for information respecting injurious farm insects.

'Dunster Lodge,
Spring Grove,
Isleworth,
11 Sept., 1886.

Dear Sir,

Your plan is most excellent, and if it was carried on throughout the country would do much sound and solid good.

In regard to books which might be of assistance, permit me to ask your acceptance of a copy of my Guide (enclosed) which I think may be of interest to yourself, my Manual would have suited you better but I have not copies by me.

My sister is now writing to direct a set of six large coloured diagrams of some of our very commonest farm insects, which I executed for the Royal Agricultural Society, to be sent to you, which she begs you will do her the pleasure of kindly accepting, and which you may like to hang up in the school—but she offers them to *yourself*. These will probably come about Tuesday or Wednesday.

I am so heavily pressed just now with work that I am only giving a slight reply to your important and judicious enquiry, but I will shortly write and enter on the subject. The plan you are suggesting is being followed at the large (quite country) Grammar School, Bunbury, Tarporley, Cheshire, with most excellent results, so much so that the Consulting Entomologist of the Department of Agriculture, Canada, wrote over for details.

But the root of the matter is common sense *practical* teaching—or rather encouragement and help to personal observation. The head master and myself make it a condition of my prizes that there should be *no examinations* on the subject—we have no strings of unintelligible words, but plain 'maggots,' and 'shanks,' and 'feet,' and so on—and the farmers and labourers greatly approve—and now owing to the energy of the lads the district is free from warbles in the cattle. We do not take the lads from their studies, and the School Inspector has expressed great gratification. I thought that this short account might interest you, but presently shall be happy, if you desire, to write more specially.

I am, dear Sir,
Yours very truly,
Eleanor A. Ormerod.

Mr. A. C.'

SCHOOL MUSEUM.

Minerals.—Iron, copper, lead, tin, silver, plumbago, quicksilver, coal, hard and soft, sulphur, slate, granite, marble, flint, malachite, spar, alum, asbestos, fuller's earth.

Fossils.—From coal measures of Lancashire and Blue lias. (The latter collected by children.)

Manufactures.—Cotton, woollen, silk, linen, leather goods, earthenware, cutlery, pens, needles, lead pencils, buttons 4 kinds, carpets.

Raw Materials for Manufactures.—Gutta percha, indiarubber, cocoa fibre, acacia gum, raw cotton, silk, flax, hemp, jute, cork.

For food.—Sugar cane and raw sugars, coffee, cocoa pod, and raw beans.

Other Materials Exported.—Shellac, indigo, madder, cocoa-nut oil, palm oil, cochineal, spermaceti, coral, nutmeg, mace, furs, cocoa-nut in husk, husks of maize, rice, ginger.

(*a*) Ears of wheat, oats, barley (full), showing after being thrashed.

Natural History.—Collections of local butterflies and moths. Preserved and mounted specimens illustrating insect life in its different stages, Oakeggar, Drinker, Tiger Moth, Buff Tip, Burnet 5 spot.

COPY OF LOG BOOK ENTRY, DATE 16TH APRIL, 1886.

Commenced Easy Lessons in bookkeeping with Standards IV., V., VI.

I feel the necessity of these lessons, to keep up the attention and attendance, a great number of farmers' children attend for these. As soon as children know their Standard work, one lesson per week is taken for the above purpose. They are of great service.

EXTRACT FROM LETTER AND MEMORANDA RELATING TO OLD SCHOLARS.

America.—

'We are living in Milwaukie, a few minutes walk from Lake Michigan. How well I remember the geography teaching you used to give us; I never see this lake but it comes quite fresh to my mind. I am working in an office as assistant book keeper and get 4 dollars 50 c. per week. Not bad I am sure you will say for a boy of my age; and another thing it helps me to learn more every day. Sometimes I sit and think of you all and wish I was with you again for a little while, and see you in the schoolroom as I used to do.'

Australia.—

I have unfortunately no letter by me now, but lately received an account by newspaper from the lad, and he was unanimously elected Secretary to a 'Young Men's Literary and Debating Society' in Rockhampton.

Germany.—

This boy is pursuing his education at a school in Hamburg, and expresses his thankfulness at having been so well grounded in English and other elementary subjects. He is thus enabled to make greater progress than would have been the case otherwise.

(To be continued.)

—o—

The Elements of Mental and Moral Science as applied to Teaching.

BY J. ADAMS, M.A.

Lecturer of School Method at the Aberdeen Free Church Training College.

[These articles are specially written to meet the requirements of candidates who are reading for the certificate examination.]

X. MORALITY.

We now come to Moral training, in its relation to Feeling, Desire, and Will. Everyone feels that he knows what morality is, yet it is a most difficult word to define. To say that it is 'Right Living,' or 'Obedience to the dictates of Conscience,' is to tell us nothing. Perhaps the best definition is: 'Morality is the discharging of our function in the universe.' This sounds very learned, but it simply means that a man is moral when he does that for which he was created. Morality, in short, is the answer to the question 'What is the chief end of man?' Since man did not create himself he does not know by intuition what he was created for: life consists in finding out one's function: and a well spent life is a life devoted to the discharge of the function when discovered. Man must try to bring into exercise all his latent powers, must seek to make the best of his nature and the most of life. Morality is, in a word, self-realization.

Etymologically Morality means our mode of life, good or bad. We speak of good and bad morals. But the term is usually understood as equivalent to virtue which is really the outcome of morality as we have defined it. There are many definitions of virtue. 'Virtue is knowledge' said Socrates, but this limitation of the term to conscious virtue is hardly just. Many men act virtuously from long habit without thinking on the matter at all, and many children and impulsive people deserve credit for good actions, although these actions are not the outcome of deliberate thought. With regard to the highest virtue, however, Socrates is right. Tigers and trees are not said to be virtuous, yet they are truly moral according to our definition, for they fulfil their function in the universe. Man's power to sin is really his highest prerogative, man alone is moral for man alone has the power of debasing himself. There are certain animals that become debauched and degraded if they find themselves in easy circumstances as to food, but they differ from man in that they always yield to the degrading influence; man may, and often does, rise above it.

According to Aristotle 'virtue is a mean between two extreme lines of conduct.' Thus Courage is the mean between rashness and cowardice. From this point of view Horace warns us to be moderate even in our virtues. This definition suited the ancients, but Christianity has changed our ideas so much that the 'golden mean' is no longer sufficient. Of some virtues we cannot have too much. It is impossible to go to excess in the New Testament 'Charity.'

There are two main views as to virtue among modern writers. One school maintains that virtue is a mere bundle of good habits. Another holds that to be virtuous one must be converted, must change all one's ways and become good by force of will. With conversion in its religious sense the teacher has little to do. In its moral sense this sudden change must not be depended upon in our ordinary work. The 'bundle of good habits' theory is more encouraging to us as teachers, for we *can* cultivate habits. But the theory is not quite accurate. The mere fact of their being a bundle implies something to bind the good habits together. The habits do not come together by chance; they are the results of a long series of good actions, which good actions were originally prompted by the will. A combination of the two theories seems necessary to explain all the facts. We are being continuously converted either to virtue or vice, and our bundle of good (or bad) habits is always increasing.

It is obviously essential to discover the meaning of the terms 'right' and 'wrong,' before we can discuss the next important point—the possibility of moral education. These opposing notions are not absolutely

fixed. What appears right to one man may seem wrong to another, or to the same man at another time. Yet there are certain actions as to the rightness of which all men are agreed. If a man lived upon a desert island and acted just as he felt inclined he would act rightly, but in society this can only be said when the man's inclinations lead him to promote the welfare of the community. This does not support Bentham's description of right conduct as that which promotes the greatest happiness of the greatest number. Happiness is the *result*, not the *aim* of right living. A certain kind of conduct is found to be most suited to assist the full development of a community—this is called 'right,' and if followed leads to happiness.

Conscience may be defined as the bias each man has to regard moral questions from a special point of view. It is largely modified by education and by our surroundings or 'environment.' An Englishman's conscience differs somewhat from a Frenchman's, and both differ widely from a Hottentot's. Since there are different kinds of consciences we must seek to cultivate the best, and that conscience is the best which is most in harmony with the spirit of the community in which we live. The moral teacher does not withdraw to a height to receive inspiration, and thence return to impart to men his doctrines. His function is to make plain the nature of virtue as it has developed itself in his community. Virtue is not mere knowledge, but without knowledge we cannot reach the *highest* virtue. A child is born into the world with a capacity for moral action. The teacher's duty is (α) to cultivate in the child the highest form of conscience with which he, as a member of the community, is acquainted; and (β) to train the child to obey the dictates of the conscience thus formed.

What is called the 'moral tone' of a school is really its corporate conscience, and as such is very much in the teacher's hands. In moulding this conscience he has two main forces at his command—example and precept. There is a tendency to undervalue the latter in proportion to the former. It is so much easier to imitate the action of another than to carry a precept into practice, that the power of the knowledge of moral principles is apt to be overlooked. Yet the moral action which is the result of moral teaching is of a higher kind than that which simply follows from the example of another. It is the distinction between instinct and reason, between the concrete and the abstract. Precept is necessary to the existence of morality, example can lead to nothing higher than moral actions. In school they must be combined. Of a model moral teacher Chaucer said:

> 'Cristes lore, and his Apostles twelve,
> He taughte, but first he folwede it himselve.'

We must be moral ourselves before we seek to teach others. But in actual teaching the relative importance of practice and preaching must be inverted. Precept is the theme, example is only the illustration. The sneer 'Don't do as I do, do as I tell you' conveys a literal truth. The best among us can only invite attention to our own conduct as an imperfect example; and even if our example were faultless we have no right to insist, on our own authority, upon our pupils imitating us. They must do this or that because it is right, not because their teacher does it.

Besides, the teacher's example does not cover the whole ground of moral experience. Children are called upon to make moral decisions under circumstances quite other than those in which they have seen their teacher act. By inculcating a few general principles we may place our pupils in a position to decide each new case upon its own merits, or at any rate, so to generalize their estimate of the teacher's character, as to be able by analogy to say how he would act in each new case. It is worse than useless to lay down an exhaustive code of laws for moral guidance. If the teacher can, by the whole style of his moral instruction, impart an elementary knowledge of what morality really is, he can dispense with rules. So soon as the distinction between right and wrong has been grasped, a working conscience has been formed. 'Conscience' it has been well said 'is but the pulse of reason.'

Though lower in its nature example must be admitted to be more powerful in its influence upon action. Without precept example produces purely mechanical moral action, while nothing but hazy theories result from precept without example. In combination they react upon each other, and each explains and confirms the results of the other. A child with no moral knowledge imitates his teacher's actions in most things unconsciously, often by an almost physical process. Thus the medical officer to one of our Normal Colleges (Scot. Blue Bk. 1877-78) calls attention to the fact that teachers who squint are the means of encouraging squinting among their pupils. A child with some moral knowledge distinguishes between mere personal peculiarities, and actions resulting from moral principles. To tell a lie and to hold one's pen wrong, are equally sinful in the eyes of a child who is left to pick up his morality from his teacher's example; to twirl one's thumbs like the teacher is as virtuous as to pray like him. Unfortunately the force of example is usually exerted against morality. 'It must be right, for the teacher does it' is too often said in justification of a doubtful act. We must therefore aim at being as nearly perfect as possible, but to lessen our responsibility as to the inevitable residuum of imperfections, we must teach children to judge for themselves.

XI. HABITS.

Habit is said to be second nature, but we must carefully guard against the idea that man has two natures, first and second. No doubt the child is born into the world with a certain nature, but as time passes we do not find the adult with this first nature, plus a second. The second nature is the first materially modified by the influence of the environment, and for the nature of this change the teacher is largely accountable. Not entirely, however, for habit implies capacity. No amount of skill and attention will form in a stone the habit of moving upwards when left to itself, or in a colour-blind boy the habit of accurately discriminating between red and green.

Habit is thus seen to be, in a vague way, some mode of acting resulting from natural capacity and practice. More accurately, a habit is the translation of a conscious principle into a continuous unconscious repetition of its application. For some reason or other we do something several times, and in so doing we are quite aware of all that our action implies. After many repetitions we can perform the action without

any thought—it has become a habit. In this sense the aim of all education is the acquiring of new habits, and the retaining of the old. In learning to speak and walk a child is acquiring habits, and when he goes to school he must retain these while acquiring more. It is too little recognised that in the lowest classes in school, reading and writing are to a great extent physical actions. The rolling eye and the panting chest of the reader of the Royal No. I., with the protruding tongue and sledge-hammer down-stroke of the young writer are eloquent witnesses to the physical energy expended. Gradually the conscious effort lessens, until the sight of the letters unconsciously excites the sound they represent, and we have a habit formed. Following out the development of the power of writing we arrive at a stage when the mere transcription has become a habit, and is a practically unconscious action. This state of affairs at once demands an advance and makes that advance possible. When the boy finds that he has overcome the difficulty of manipulating his pen, he longs for something new, and his acquired dexterity enables him in the dictation lesson to think only of the spelling—the writing comes without thought. And here we notice the application of our restriction in speaking of Education—'and the retaining of the old.' For unless we maintain the habit of good writing it will degenerate into scribbling. Next, writing and spelling correctly becomes a habit, and the mind is left free to attend to accuracy and elegance of expression as in paraphrasing and re-telling stories. Finally, the mere expression becomes matter of habit, and ideas obtain the undistracted attention of the writer; and so on to the highest form of original composition.

True life may be defined—considered apart from mere physical existence—as the application of principles to new cases. Thus, in the progress we have traced, no sooner is a habit acquired than the mind feels itself dead while doing the habitual action, and feels impelled to seek a new outlet for its energy. That man is the most highly cultured who has reduced the greatest number of intellectual operations to habits, and therefore has his true life among the highest intellectual pursuits. A man's life may, in fact, be compared to one of the deep coral reefs of which only the top part is formed of living animals. But to supply a basis for this life millions of polypes had to die. The dead polypes are our habits, the living our present life. So true is it that we of our dead selves make stepping stones to higher things. But Botany supplies a still truer parallel. There is in each living twig a point at which the cells are less differentiated than elsewhere; as they pass from this point they acquire those special characters suited to their function in the plant. This 'growing point' represents our true life, while the special cells proceeding from the growing point, alive it is true, but only living under certain hard and fast conditions, may fairly be compared to our habits.

There are two main classes of habits (α) those which we deliberately seek to acquire, and (β) those which unconsciously grow upon us. In the former the habit is the end in the sense of the aim, in the latter it is the end only in the sense of the result. We write often in order that we may write easily and well; but we may do something because we like to do it, and as a result keep on doing it, till it becomes a habit. This distinction is recognised in ordinary language. We never say that a man has *fallen into a habit* of writing well. With regard to the former, Fichte is obviously wrong when he says that to form habits is to fail. To form such habits is really to succeed. And the same is true even of the second class. Unless we form habits in the sense in which we have defined them, we can make no progress. Our every-day actions would demand all our attention, and we would have no superfluous force to perform unwonted actions. What Fichte wishes to guard against is the dead level of routine. The man whose life moves in ruts is practically dead. But this is true not because he retains his old habits, but because he has ceased to form new habits. In such a nature the growing point is dead, and the whole organism suffers from fatty degeneration. With this loss of habit-forming capacity we have almost nothing to do, since we get plastic natures to work upon. Our object is rather to ingraft as many good habits as we can.

Of the habits we must seek to cultivate in school there are two divisions—Moral and Intellectual. We cannot here make a catalogue of all the desirable habits, but we may notice a few of the more important. Of the moral habits the first is *truth-telling*. It was epigrammatically said of an ancient people that they taught their youths to draw the bow and speak the truth, implying that this one virtue is in itself a moral training. The two forms in which children are liable to speak falsely are 'white lies,' and exaggeration. The former must be sternly condemned; the latter may be gently dealt with, as it usually results from an over-active imagination. In fact Richter says that no child under five can lie even though he never speak the truth.

Common honesty in school work and loyalty to each other must result from the general tone of the school. Tale-bearing should be absolutely discouraged. It is better that guilt should sometimes go unpunished than that sneaking should be allowed. Exceptional cases may arise—when for example there has been bullying—when honour compels a boy to 'tell.' But these are rare, and call for special treatment. *Decision* of character is a purely personal habit, but may result from the method of teaching. An undecided boy should get a fair chance to answer a question, but the custom of waiting till he makes up his mind is pernicious. To hurry him on the other hand is to encourage rash judgments, so if, after a reasonable time, he cannot decide how to answer, he must lose his mark. *Self-respect* depends upon the relations between a man and his fellows. No child can retain his self-respect if treated like a dog by his teacher. A child who at the call 'Come here, sir,' is accustomed tremblingly to approach a man with a stick in his hand, is not likely to know the meaning of self-respect. We must try to attain that medium between harshness and gentleness which on the one hand restrains forwardness and on the other removes abjectness.

Closely connected with self-respect are all the habits of *politeness*. The mechanical 'Thank you' does not imply very much gratitude: it is rather the acknowledgment of our mutual dependence, and all our actions must be in keeping with this courteous phrase. Our children ought to be taught to rise when a visitor enters the room. This implies no obsequiousness, we naturally rise when anyone enters our room. The visitor, however, is grossly lacking in manners who—as is sometimes done—receives this attention

as his right without bowing in return. We cannot insist upon much attention to the forms of politeness in the playground. If we manage to ingraft the *spirit* of politeness, and to keep the language pure, we may rest perfectly satisfied. Besides, many school games have a rigid enough etiquette of their own. *Punctuality* is a form of politeness towards the teacher, and can be best taught by example. The bell should ring promptly at the hour of meeting, and it should be specially arranged not to delay the dismissal a single moment. *Cleanliness* and tidiness must be taught by example, and aided by supplying the means. The five or ten minutes interval in each school attendance, a good supply of water, with a little supervision of careless boys will serve the teacher's purpose. The custom sometimes adopted of arranging the children in a row every morning and examining their faces, necks, teeth, and outstretched hands, with ignominious dismissal to the pump if unsatisfactory, ensures cleanliness, it is true, but at the expense of self-respect.

Of the intellectual habits one of the most important is that of *speaking in sentences*. This does not mean that the child should be taught to speak pedantically. We merely insist that the child should mention what he is thinking about, and what he thinks about it. Meaningless phrases like 'Dunno,' 'Please for a boy,' should be altogether discouraged. The Habit of *inquiry* is easily acquired, but not so easily directed. It is hard to say where love of knowledge ends, and impertinent curiosity begins. A good general rule is that so long as the personal element is kept out, all desire for knowledge is legitimate, and should be encouraged. The habit of *verification* is very valuable, but also dangerous in children. 'Credulity is the charm of childhood,' but we must teach that nothing which can be put to the proof ought to be taken on trust. *Observation* is a valuable habit, and is best attained by training the power of comparison. Full scope is given to this power in the science lesson by analogy, and in the language lesson by metaphor. The most important intellectual habit is that of *continuous thought*. It must be very gradually approached. A connected story in the lowest class; then in order very short lessons on form or colour; lessons on objects; easy problems in arithmetic, mark the stages of progress. Finally in the highest class the science and grammar lessons, but especially the composition exercise, will train the mind to think steadily upon a given subject.

(To be continued.)

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Animal Physiology.

BY ARTHUR NEWSHOLME, M.D., AND C.S.S. (LOND.)

THE excretory function of the lungs has been described in the last chapter. The kidneys have equally important functions, and these must now engage our attention.

Anatomy of Kidneys.

The two kidneys are placed in the lumbar region on either side of the vertebral column, lying between the lower ribs above and the upper ridge of the innominate bone below. The weight of each kidney varies from four to six ounces. Its shape has been compared to that of a bean, the concavity of which, called the *hilum*, points inwards towards the spine.

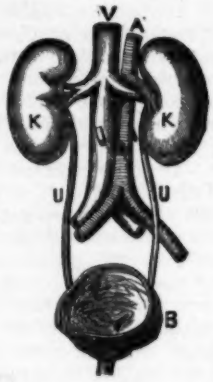


Fig. 51.

Diagram showing relation of the various parts of urinary apparatus to each other, and to the great abdominal vessels. K K, the kidneys; V, inferior vena cava; A, the aorta; U U, ureters; B, the bladder.

In Fig. 51 the relative position of the kidneys, as regards the remainder of the urinary apparatus and the great abdominal vessels, is diagrammatically shown.

The kidneys are imbedded in a considerable quantity of fat (the suet), which protects them from sudden alternations of temperature, and helps to fix them in their position.

On making a vertical section of the kidney (see fig. 52), it is seen to present a cavity at the hilum, continuous with the dilated origin of the ureter, which carries the urine down to the bladder. This cavity is called the pelvis of the kidney. The pelvis has smaller cavities opening into it, called calices, and each calyx receives the apex of one or more of the pyramids of the kidney.

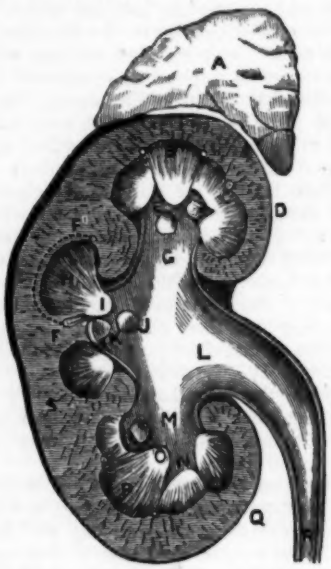


Fig. 52.

Vertical section of right kidney. A, suprarenal body; B, C, H, P, medullary substance and pyramids of kidney; D, S, Q, cortical substance; I, apex of pyramid; E, K, M, calices of kidney; L, pelvis of kidney; R, ureter.

The proper substance of the kidney is seen in the section to consist of two distinctly marked parts, an outer or cortical substance, and an inner medullary or pyramidal part. The cortical part is reddish and granular, and sends little prolongations between the pyramids. Its usual thickness is about one-sixth of an inch. The medullary substance consists of about twelve to fifteen pyramids, the apices of which project into the calices of the pelvis of the kidney. Its colour is darker red than the cortical substance, and is marked by striæ which run in a fan-like manner straight from the apex to the base of each pyramid.

The apex of each pyramid as it projects into the pelvis of the kidney presents from 10 to 25 minute openings, the diameter of which varies from $\frac{1}{300}$ to $\frac{1}{60}$ inch. These openings are really the terminations of minute tubes, of which the substance of the kidney is chiefly composed.

Course of a uriniferous tubule.

If one of these tubes is traced from its termination at the mouth of the kidney to its commencement in a Malpighian body, the following distribution occurs, as shown in fig. 53.

The tube leading from the pelvis of the kidney immediately divides at a very acute angle, generally dichotomously, the division being repeated, until a bundle of tubes are produced from the original one. These are called the straight tubes of the kidney. They vary in diameter from $\frac{1}{300}$ to $\frac{1}{1000}$ inch, and consist of a strong structureless basement membrane, lined by a single layer of polygonal nucleated cells. The straight tubes on entering the cortical part of the kidney become continuous with convoluted tubules (B^1 fig. 53), known as intermediate tubules, which have thin walls and are lined by pavement epithelium.

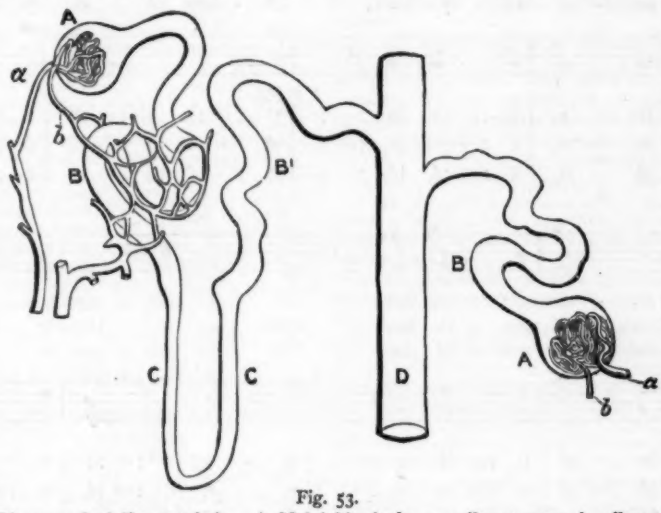


Fig. 53.

Diagram of uriniferous tubule. A, Malpighian body—a, afferent artery, b, efferent vein; B B^1, convoluted parts of uriniferous tubule: C C, looped tube of Henle; D, straight tube.

Thence they join the *narrow tubes of Henle* (C C, fig. 53) which form loops, extending some distance into the pyramids. The diameter of these tubes varies from $\frac{1}{1000}$ to $\frac{1}{2000}$ inch. The tube of Henle joins the convoluted tube shown at B, fig. 53, which attains a diameter of $\frac{1}{300}$ inch, and is lined throughout by polygonal granular cells, somewhat larger than those lining the straight tubules. The convoluted tube at its further end becomes constricted and narrow, and then dilates into the Malpighian body or capsule (A, fig. 53). We have thus traced a uriniferous tubule throughout its course. The Malpighian body is simply a rounded dilatation at the commencement of the uriniferous tubule. Its diameter varies from $\frac{1}{300}$ to $\frac{1}{100}$ inch. The membrane forming the main texture of the Malpighian body is similar to, but stronger than, the basement membrane of the uriniferous tubules. It is lined by a layer of pavement epithelium cells. The cavity of the Malpighian body contains a loose tuft of capillary blood vessels. Whether these are covered partially or entirely, or not at all, by similar epithelium to that on the internal surface of the Malpighian body is a disputed point. The minute afferent artery bringing blood to the Malpighian body pierces its capsule and then breaks up into a tuft of capillaries (A, fig. 53). These join to form an efferent vein, which subsequently forms a second capillary plexus, surrounding the convoluted tubes (B, fig. 53). This has been called the portal system of the kidney; and it is important to note that this is the only instance, except in the portal system of the liver, in which veins break up and form a second group of capillaries.

The uriniferous tubules and blood vessels of the kidney form the greater part of its structure. In addition to these there is a delicate fibrous tissue, and numerous lymphatic vessels. The blood leaving the kidney by the renal vein is probably the purest in the body.

Urine is being constantly secreted by the kidneys. Its discharge is not however equally constant, and in this respect the urinary excretion offers a marked contrast to the perspiration and excretory products from the lungs—the elimination of which never intermits. The retention of urine in the bladder is however simply a matter of convenience, and none of it is absorbed through the vesical walls into the circulation.

The ureters reach from the inner margin of each kidney to the base of the bladder. They are about the size of a goose-quill, and from 16 to 18 inches in length. Their passage through the wall of the bladder is oblique, and a valvular opening is thus produced, which allows free descent of urine, but which is closed by contraction or by distension of the bladder, and thus return of urine is prevented.

The bladder when filled contains about a pint of urine, but by undue distension it may, as in cases of disease, be made to contain ten to fifteen times as much.

The walls of the bladder consist largely of involuntary muscular fibres, arranged vertically and obliquely and in a circular manner. There is a special development of the circular fibres at the neck of the bladder, which act as a sphincter.

(To be continued.)

MILKING TIME.

Moderato.
mf
1st TREBLE.
2nd TREBLE.
BASS.
1. Hark, the tramp a - down the lane! O - pen wide the barn - yard gate,
2. Plea - sant hour so fresh and cool, Plea - sant light of set - ting sun,
3. Now the sweet and foam - y milk, In our lit - tle bowls we pour,
KEY B♭.
mf
1st TREBLE.
2nd TREBLE.
BASS.
f
See the cows are com - ing in, And we must not make them wait;
Bring the pails and milk - ing stool, Close the gate till all is done;
And a mer - ry sup - per make, Sit - ting at the o - pen door;
f
F.t.
Hear the mu - sic of their bells, Of the milk - ing time it tells; I -
Milk the cows with gen - tle hand, While so pa - tient - ly they stand; I -
Sha - dows fall, we soft - ly sing, This is plea - sure for a king; I -
f.
f.B♭.
f
p
- o! I - o! I - o! To the yard we all will go.....
- o! I - o! I - o! See the stream is white as snow.....
- o! I - o! I - o! Oh no high - er joy we know.....
p

Certificate Examination, 1885.

Male Candidates.

SECOND YEAR.

Geography.

2. Lancashire is one of the great manufacturing counties and a county palatine. It is bounded on the N. by Westmoreland and Cumberland; E. by Yorkshire; S. by Cheshire; and W. by the Irish Sea. It is divided into two very unequal parts by Morecambe Bay. The northern and smaller part is called the district of Furness. It is hilly in the N. and extreme E., but elsewhere mostly level. The principal crops are potatoes and oats, but much more land is laid out in pasture than in tillage. Coal is the chief mineral, and is worked in the S. Ironstone is abundant in Furness. Lancashire is especially noted for its immense cotton manufactures, which are carried on at Manchester, Oldham, Bolton, Bury, Rochdale, Burnley, Blackburn, Preston, Chorley, and Wigan. Lancaster, on the Lune, the county town, has an old castle, and cotton and sundry other manufactures. Liverpool, on the Mersey, is the second port of Britain, and trades chiefly with America in cotton, tobacco, and sugar. Manchester, on the Irwell, with Salford, forms one large city. It is the metropolis of the cotton district, and the first manufacturing town in the world. Blackpool and Southport are well-known watering-places.

3. *Ben Nevis* is the principal summit of the Grampians, which run through Perthshire and Inverness-shire. *Helvellyn* is one of the chief heights in the Cumbrian group, and *Snowdon* is the highest summit of the Cambrian range in Wales.

Helvellyn is situated on the borders of Cumberland and Westmoreland in the midst of the most picturesque scenery to be found in England. The height and character of the hills, the lakes they imbosom, the mountain streams, and the rich vegetation of some parts, all combine to render this part of the country an attractive resort of visitors. The Cambrian hills have none of the sameness and tameness that characterise most of the Pennine hills, but are generally steep and rugged, and often well wooded. Among the numerous heights in the neighbourhood may be mentioned Scawfell (3229 ft.), the highest in England, Skiddaw and Saddleback. The largest lakes are Windermere (11 miles long and one broad), Ulleswater (9 miles by one), Coniston, and Bassenthwaite. Windermere and Ulleswater are situated amid the highest hills of England, and fine cascades are formed in various parts by the mountain streams rushing over the steep rocky edges.

4. The chief fishing towns of the east coast of Great Britain are as follows:—

Wick, the county town of Caithness, the great centre of the Scotch herring fishery.

Peterhead, in Aberdeen, the principal station of the whale fishery; it is also engaged in the herring fishery.

Dundee, at the mouth of the Tay, is also engaged in the whale fishery. It is especially noted for its linen manufactures.

Gt. Grimsby, at the mouth of the Humber, has fisheries of cod, ling, haddocks, &c.

Gt. Yarmouth, at the mouth of the Yare, is the great seat of the herring fishery.

Lowestoft, the most eastern town of England, is also noted for herring fishing.

Colchester, on the Colne, and a military station, is noted for its oyster fisheries.

The *Dogger Bank* is a submarine bank in the North Sea, midway between England and Denmark, and is frequented by immense shoals of cod. It is 60 ft. below the surface.

The *Goodwin Sands* are situated about seven miles off the coast of Kent, and stretch from N. to S. They are very dangerous to shipping. They at one time formed part of the mainland, but the owner, Earl Godwin, neglected to keep the dykes in repair, and so lost them.

The *Yarmouth Roads* lie off the coasts of Norfolk and Suffolk. They afford safe anchorage for ships.

5. The Channel Islands are situated in the Bay of Avranches, to the N.W. of the Cotentin Peninsula. Alderney, the nearest to the French coast, is not quite nine miles distant. Guernsey, the farthest, is about 30 miles distant.

The chief industries are agriculture and fishing. They export considerable quantities of early fruits and vegetables to the London market. Alderney has a fine breed of cows, remarkable for the excellence of their milk.

They have formed part of the English Dominion ever since the Norman Conquest (1066).

They are governed by a Lieutenant-Governor. The chief civil officer in each island is the bailiff or judge, who is appointed by the Crown.

6. British India is divided for purposes of government into nine Provinces, viz., (1) Bengal, (2) North-West Provinces, including Oude, (3) the Punjaub, (4) the Central Provinces, (5) Mysore, Berar, and Coorg, (6) Assam, (7) British Burmah, (8) Madras, (9) Bombay.

Bengal includes (1) the basin of the Ganges (Bengal Proper and Bahar), and (2) Chota Nagpoor. The boundaries of Bengal are: on the N. Nepaul, Sikkim and Bhotan; on the E. Burmah and Siam; on the S. the Bay of Bengal; and on the W., Nagpore, Rewah, and the N.W. Provinces. The climate, owing to the periodical rains and the great heat, is very moist. About two-thirds of the population are engaged in agriculture. The chief products are opium, indigo, jute, and grain. Bengal is the lowest, the most fertile, and the most thickly populated portion of the peninsula, as the Ganges flows right through it. The chief towns are Calcutta, the capital of India, situate on the Hooghly, a branch of the Ganges, about 100 miles from the sea; Jessore, Moorshedabad (silk and carpets), Dacca, Burdwan (coal), Patna (rice), Cawnpore, Lucknow, and Delhi.

7. *Surat*, at the mouth of the Taptee, was formerly a very flourishing town. The first English factory was established here in 1612.

Fort St. George was the old name of Madras. This is badly situated for commercial purposes, possessing no harbour. It exports cotton, indigo, coffee, and sugar.

Bombay is the second city in population in the British Empire. It has spacious dockyards, and one of the largest and securest harbours in India. The Parsees, descendants of a colony of Persian Fire-Worshippers, form a large part of the population.

Bengal has been described above. (No. 6.)

Behar, formerly a province, now forms the two divisions of Patna and Bhangulpore, comprising ten collectorates, which are under the immediate superintendence of officers called collectors.

Orissa is one of the tributary States attached to the Province of Bengal. It extends south-west along the Gulf of Bengal.

8. *Ceylon* is a pear-shaped island, 60 miles S. of Hindostan, and separated from it by Palk's Straits and the Gulf of Manaar. Its length is 270 miles, its breadth 100 miles. It is mountainous in the centre. The highest points are Pedrotallagalla (8260 ft.), and Adam's Peak (7400 ft.). Ceylon is well watered, but it has no important river. The mountains are clothed with verdure to their summits, and the deep valleys are renowned for their rich and beautiful foliage.

The principal articles of export are cocoa-nuts, oil, coffee, and cinnamon.

9. In 1664 the French began to colonise Canada. About the same time the English began to acquire large possessions in what is now known as the United States. The consequence was that from about the year 1680 to 1759 almost continual warfare was carried on between the French and English, with varying success. In 1759 three distinct bodies of English troops were sent to invade Canada. The French were defeated under the walls of Quebec, though Wolfe fell in the action; and the town opened its gates to the English. In 1763 the whole province was formally ceded to England by the Treaty of Paris.

The cause of the recent disturbance in Canada was as follows:—A half-breed named Louis Riel was reported to have murdered a man. He, being 'wanted' by the authorities on this account, took refuge among the other half-breeds, who banded together to defend him. Thus, a rebellion broke out, with Louis Riel at its head. It was soon quelled, and Louis Riel taken, but the murder could not be proved against him.

10. *Reptiles* are not abundant in Australia. Several kinds of snakes, some of which are venomous, are met with in different parts of the country. A species of crocodile or alligator frequents rivers along the W. and N. coasts.

Most of the quadrupeds are marsupials, that is, they are provided with a bag, in which they carry their delicate young about with them wherever they go. They comprise numerous species of kangaroo, ring-tailed opossums (phalangers), flying opossums (petaurists), wombats, bandicoots, kangaroo-rats, and others of similar nature, almost all of which are nocturnal.

Nearly all the *trees* are evergreens, the change of the seasons producing no apparent influence on the invariable olive-coloured tint of the Australian forests. The timber-trees consist of wattles (acacias), and gum-trees (eucalypti). Some are very hard, and well adapted for ship-building, as well as for other purposes, useful and ornamental. Tree-ferns and nettles of a tree-like growth are common, and palms are found in the N. and interior.

11. In *North Island* the centre is occupied by broad and lofty mountains, which send off spurs to the sea-coast wooded almost to their summits. The highest summit in the central range is Ruapahu, an extinct volcano (9,000 ft.) North of it is Tongarino, an active volcano. Mount Egmont, near its S.W. corner, is an extinct volcano, 9,000 ft. high.

South Island is traversed throughout its whole extent by a mountain range which runs nearer its western than its eastern side, and called in its highest portion the Southern Alps. Mount Cook, in this range, is the loftiest summit in New Zealand (13,000 ft.)

Three distinct lines of craters occur in N. Island; one at the Bay of Islands, one at Auckland, and one from Mount Egmont to White Island in the Bay of Plenty. White Island is so heated that it is dangerous to walk on it. No craters are known to exist S. of Cook Strait, which is the centre of the earthquake region. There appears to be a gradual rising of the whole group of islands. Grand and beautiful geysers ejecting water of 214° F. temp. are found around Lake Rotorua and Lake Rotomahana a little further south. Magnificent terraces composed of siliceous material deposited by the water existed in the neighbourhood of the latter lake. These were all destroyed by a recent earthquake.

12. The Lesser Antilles, called in early times the Caribbean Islands, were named by the Spaniards, soon after their discovery, *Windward Islands;* and those lying along the coast of Venezuela, viz., Oruba, Curaçao, Buen-Ayre, &c.—the *Leeward Islands;* and these terms 'windward' and 'leeward' are well applied from the fact that the former lie in the direction whence the prevailing trade wind blows, while the latter are in the lee. We, however, have divided the Lesser Antilles (of which the greater number belong to ourselves) into groups; calling the northern portions of the chain between Porto Rico and Martinique, the *Leeward Islands*, and restricting the name *Windward Islands* to the southern portion of the chain, from Martinique to Trinidad inclusive. It is in this latter sense, therefore, that the terms are used by the British Government.

The *Bermudas* consist of a group of islands and rocks all lying in an area 20 miles in length and three in breadth, and situate in the Atlantic Ocean, about 600 miles East of Cape Hatteras. Only five of the group are large enough to be inhabited, viz., Bermuda, Somerset, St. George, Ireland, and Boaz. They are surrounded on the north, west, and south by formidable coral reefs. The islands are low, and mainly composed of a soft, white stone, formed of the *debris* of mollusca, coral formations, and large beds of microscopic shells. The climate is described as a perpetual spring, and is especially adapted for the growth of potatoes, onions, beetroot, and tomatoes. Arrowroot comes to perfection here, but its cultivation is neglected. The chief trees are cedar trees, which alone are able to withstand the fury of the occasional storms. The chief towns are:—*Hamilton*, the capital, and *St. George*, the head-quarters of the military. It was first colonised by the English in 1612, from which time it has formed part of the British Dominions. The importance of Bermuda consists chiefly in the fact that it forms a capital naval station for our fleet between this country and N. America.

13. There are two seasons, the wet and the dry. The former lasts from May to November, and always begins and ends with hurricanes. The wet season is very unhealthy. The low land near the coast is especially unhealthy, owing to the prevalence of fevers. The Harmattan wind, which is the great current of air which rushes from Europe in the winter to fill up the void in the heated atmosphere, is the most healthy wind, and arrives at the end of November.

The chief articles of trade are:—(*exports*) ground-nuts, teak, ivory, palm-oil, gum-arabic, beeswax, and gold dust; (*imports*) India goods, cotton goods, arms, ammunition, hardware, beads, ales and wine.

Communication with the interior of Africa is carried on by means of the Rivers Gambia and Congo. The English have at intervals on the banks of these rivers for many miles into the interior, trading stations which are used for collecting and despatching the produce brought down by the natives from the plains and forests.

OUTLINE OF A LESSON ON THE CHIEF COALING STATIONS FOR OUR FLEET, DISTRIBUTED THROUGHOUT THE GREAT OCEANS.

Chief Points in the Lesson.	Manner of Teaching.
Necessity for Coaling Stations ...	Explain this by showing that a steamer cannot ship sufficient coal to last a voyage to Australia, whether she goes by way of Aden (Overland Route) or *via* the Cape. Question where possible.
In the *Indian Ocean* the coaling stations are:— *Aden*, near the entrance to the Red Sea; *Mauritius*, about half-way between Aden and Australia; (Coaling-stations on the Overland Route) *Singapore*, the principal station of the P. and O. steamers in the East.	Show these places on the map, and, having obtained from the children the reason for selecting these stations, describe the importance of each. Trace the Overland Route.
In the *Atlantic Ocean*:— *St. Helena*, 1,200 miles from Africa, and 1,800 from Brazil, is in the direct line of ocean commerce from India and the East Indies to Europe, *via* the Cape.	Show its greater importance on account of its being at such an immense distance from both continents.
In the *Pacific Ocean*:— The *Fiji Islands* will be very valuable as a coaling-station on the great highway between America and Australia.	Show on map, and explain the reason; on account of its natural resources and position.

Female Candidates.

SECOND YEAR.

Geography.

2. The animals used as beasts of burden in the British Empire are:—

The Horse.—Most generally used, and adapted for all ordinary traffic.

The Ass.—Used in Malta and Gazo, and by costermongers in England. It can bear exposure and hardship.

The Mule.—Used in Cyprus. It combines the good qualities of the horse and ass. It is very sure-footed, and thus adapted for mountain traffic.

The Ox.—Used in Cape Colony and India. It is adapted for rough travelling as it is patient, steady, and docile.

The Camel.—This is used in India and Cyprus. It is specially suited for long journeys through deserts, as it can go for many days without water.

The Elephant.—This is used in India, its native land. It has immense strength, and is extremely docile.

The Yak, Humped or Indian Cow, Goat, and Sheep.—All these are used in India for traversing the passes of the Himalaya and other mountains, as they are very sure-footed.

The Dog.—These are especially used by the Esquimaux in North America for traversing the ice, as, being small, the ice is not so likely to give way beneath their weight. Hence travelling is safer.

3. Since the earth rotates on its axis from W. to E. in twenty-four hours, the sun passes over 15° of longitude in an hour. Hence about four hours after he has risen on Great Britain, he will rise over some of the West Indies (near 60° W.L.). Two hours later he will rise in the west part of Canada (long. 90° W.). Three hours later, on the most western part of Hudson Bay Ter. (long. 135° W.). Three hours later, when setting on Britain, he will rise on E. part of New Zealand (long. 180 W. or E.). Two hours later on Australia (long. 150° E.). Two hours later on West Australia (120° E.). Two hours later on Calcutta. Three hours later, on Aden (long. 45° E.). About an hour later, on Natal and Cape Colony (long. 28° E.), and two hours later, on Great Britain again.

4.

Product.	Chief Producer.	Product.	Chief Producer.
Tea	Assam (India)	Palm Oil	West Africa
Coffee	Ceylon	Cod Oil	Newfoundland
Pepper	Malabar (India)	Petroleum	Canada
Salmon	Scotland (B. Columbia)	Rice	India
Wool	Australia	Cotton	India
Mutton	New Zealand	Wine	Cape Colony
Flax	Canada	Timber	Canada

5. *The Clyde* rises in the Lowther Hills, not far from the sources of the Annan and Tweed, at an elevation of 1,400 feet. At first its course is northwards, and then making a sudden turn to the S.W., it is joined by the Douglas. Immediately afterwards, near Lanark, it forms a succession of beautiful cataracts (Bonnington, Cora Lin, and Stonebyres). The river now takes a N.W. course, and receives in succession the Avon, N. and S. Calders, Kelvin, and Cart. At Dumbarton, where it receives the Leven from Loch Lomond, the Clyde spreads out into a broad estuary, which at Greenock is four miles wide. The Firth bends to the south below Greenock, and spreads out into the open sea. Its length to Dumbarton is about 98 miles.

The Indus rises in Thibet, at an height of 22,000 feet. During the first 500 miles of its course it is known as the Sinkabab, *i.e.*, the river which proceeds from the lion's mouth. It flows for nearly 900 miles before it reaches the plain of India at Attock; its course is then to the S.W. for 900 miles more. Its whole length is about 1,800 miles. The two principal affluents are the Cabul river on the right bank, and the Chenaab, with its tributaries Jhelum, Rave, and Sutlej, on the left. The Indus flows into the Arabian Sea.

6. Starting on our coasting voyage from Bombay, we sail southwards. For about the first 300 miles we see nothing to draw our attention except the Western Ghauts, rising to the height of 4,000 feet, and broken only by the many gorges or ghauts which give access to the central table land. We then reach Goa, one of the three Portuguese possessions in India (Goa, Daman, and Diu). About 200 miles further south we come to Mangalore, capital of South Canara. Mahé is about 50 miles further south, and is a French possession. We still continue our course southwards, passing Calicut, formerly a seaport of great importance, but not now so flourishing; Beypore, Cochin, and Trivandrum, the capital of Travancore. Rounding Cape Comorin, the most southern point of India, we enter the Gulf of Manaar, and begin our northward journey. We pass through Palk Strait, separating Ceylon from India, and proceeding north, pass the delta of the Cauvery and the towns of Carical (French), and Tranquebar. Passing Pondicherry (French), we at length reach Madras, nearly the oldest British possession in India, possessing no harbour, and which exports cotton, coffee, sugar, &c. A little north of Madras is a salt water lagoon, called Lake Pulicat. About 150 miles north of this we reach the delta of the Kistnah, and Masulipatam with important manufactures. Here the coast takes a north-east direction. We soon reach the delta of the Godavery and Cooringa. After leaving this place nothing claims our attention until we arrive at Lake Chilka, another salt water lagoon, close to which is Juggernaut, famed for its fête. We then pass the delta of the Mahanuddy, and at last enter the Hooghly, the principal mouth of the Ganges, and on which stands Calcutta, about 100 miles up its mouth.

7. *Hong Kong* is mainly valuable to us as a trading station for our commerce with China, and as a military and naval station for the protection of our commerce in Chinese waters.

Malta, owing to its central position in the Mediterranean, is of very great commercial and military importance. It is the head-quarters of a fleet which can appear on any shore in the Mediterranean in a few days.

Gold Coast is one of the chief centres from which commerce is carried on with the interior of Africa. Its possession facilitates the suppression of the slave trade.

Aden is a strong military post, with an admirable harbour for steamers. It is a trading station, and of special importance as a coaling station.

Cyprus may become of great service in checking Russian aggression in Asia, and owing to its proximity to Egypt assists us in keeping sight over it.

8.

1. Birmingham	100 miles.		6. Cape Town	8000 miles.	
2. Belfast	250	,,	7. Bombay	12500	,,
3. Glasgow	350	,,	8. Ballarat	14000	,,
4. Aberdeen	480	,,	9. Ceylon	14000	,,
5. Quebec	3500	,,	10. Calcutta	15000	,,

9. *Hobart Town* is near the mouth of the Derwent, S.E. of Tasmania, of which it is the capital. It has an excellent harbour, considerable trade, and a population of 23,000.

Dunedin is at the head of Otago Harbour, on the S.E. of South Island, New Zealand. It is the capital of Otago.

Lucknow is situated on the Goomtee, a tributary of the Ganges. It is the seat of government of Oude. It is adorned with mosques, tombs, and palaces. During the Indian Mutiny it was besieged by the rebels, but was relieved by Havelock.

St. John's is situated on the S.E. coast of Newfoundland, in the peninsula of Avalon. It is the only town in Newfoundland. It exports fish and oil.

Manitoba is a section of the S. fertile belt of the N.W. territory immediately adjoining the boundary of the United States, and includes part of the lower basins of the Assiniboine and Red River. It has a very fertile soil, producing prodigious wheat crops. Its capital is Fort Garry.

Port Elizabeth is situated on Algoa Bay, on the S.E. of Cape Colony. It is the principal part of the E. province, and is of increasing commercial importance.

Sierra Leone is a district lying on the coast of Africa a little S. of the Gambia, and between 8°—10° N. lat. Its capital is Freetown. It exports palm-oil, ground-nuts, and teak.

D'Urban stands on Port Natal, and is the only port of Natal.

10. *Physical Features.*—I. *Coast.* This is greatly broken on the N. and W., but little indented on the S. and E. The chief openings are on the *N.*, Loughs Foyle and Swilly; on the *W.*, Donegal, Clew, and Galway Bays, Mouth of the Shannon, Dingle, Kenmare and Bantry Bays. On the *South*, Kinsale, Cork, Youghal and Waterford Harbours. On the *E.*. Wexford Harbour, Dublin and Dundalk Bays, Carlingford and Belfast Loughs. Thr chief headlands are: on the *N.*, Fair Head, Malin Head and Bloody Foreland; on the *W.*, Rossan Point, Erris Head, Achill Head, Slyne, Loop and Mizen Heads; on the *S.*, Cape Clear and Carnsore Point; on the *E.*, Wicklow and Howth Heads.

There are a few small islands: on the *N.*, Rathin Isle; on the *W.*, North and South Arran Isles, Achill Island, and Valencia Isle.

II. *Interior.*—The *mountains* for the most part lie near the coast; the chief are the mountains of Donegal, Mayo, and Galway; the Magillicuddy's Reeks in Kerry, the Knockmealdown Mountains in Waterford; the Wicklow Mountains in Wicklow, and the Mourn Mountains in Down. The only inland range is the Slieve Bloom Mountains between King's County and Queen's County.

The interior of the country is mostly flat, one-tenth being occupied by bogs, whence spring the following rivers:—The Bann (forming Lough Neagh in its course), Foyle and Swilly, flowing to the N.: the Erne (forming Lough Erne), the Moy, the Clare-Galway, draining Lough Corril, the Shannon (214 miles long, forming Loughs Allen, Ree, and Derg), flowing W.; the Lee, Blackwater, Suir, and Barrow, flowing S.; the Slaney, Liffey, Boyne, and Laggan, flowing E. The country has many lakes besides those already mentioned; of these those of Killarney are famed for their great beauty.

Climate mild and humid, owing to prevalence of west winds; warmer in winter and cooler in summer than England.

Population now but little in excess of that of London. The diminution is due to the unsettled state of the country and successive failures of the potato crop. The great majority of the people are of Keltic origin. The English language is generally spoken, the native dialect, although in the process of becoming extinct, being still spoken by the peasantry in the S. and W.

Industries:—*Agriculture and grazing* form the chief occupation. *Dairy farms* are numerous, and much pork, bacon, and butter is exported. The most important crops are oats and potatoes.

Linen is the most important manufacture; carried on in Ulster (Belfast and neighbourhood).

Woollen goods are made in Dublin, Kilkenny, and Wicklow.

Cotton goods at Belfast and its neighbourhood.

Frieze, a coarse kind of woollen cloth, is made in most parts of the country.

Whisky is largely distilled, and beer is extensively brewed, especially in Dublin. Among other manufactures are those of poplin, hosiery, and lace.

11. NOTES OF A FIRST LESSON TO STANDARD VI. ON THE BRITISH POSSESSIONS IN THE WEST INDIES AND SOUTH AMERICA.

Chief Points of the Lesson.	Manner of Teaching.
Introduction:— The advantages of having possessions in the W. Indies and S. America.	Briefly state these, showing that we are largely dependent on these possessions for sugar, rum, dyewoods, our most useful drugs, &c. Show their position on the map, and account for the name 'Indies.'
The West Indies consist of an extensive system of islands between the continents of N. and S. America, stretching from Florida to the mouth of the Orinoco.	
Three Divisions:—Greater Antilles, Lesser Antilles, and the Bahamas.	Show the relative position of these.
Britain possesses one of the first group (Jamaica), nearly all the second, and all the third.	
The Lesser Antilles are divided into two groups: the N. part being called the Leeward Islands, and the S. part the Windward Island.	Explain the meaning of the words Windward and Leeward, and show the difference between the present use of these terms by the English, and their former use by the Portuguese.
S. America:—	
British Guiana on the N.E. coast from the mouth of the Orinoco, eastwards to R. Corentyn.	It might be noticed that the W. Indies extend to the Orinoco, and that British Guiana begins there. This would aid the remembrance of their relative position.

12. The chief points of interest in *Edinburgh* are the Castle, erected on a lofty precipitous rock, containing the regalia of Scotland; Holyrood Palace, the ancient residence of the Scottish sovereigns; Calton Hill and Arthur's Seat, two conspicuous eminences. The town is divided into two parts, the Old Town is very irregular, and remarkable for many old houses of great height, but the New Town is symmetrically laid out in streets and squares. It has very little trade, and few and unimportant manufactures.

In *Calcutta*, the chief objects of interest are the many handsome buildings. These are so numerous that the city is frequently called the City of Palaces.

The native population is engaged in the manufacture of silk fabrics, carpets, turbans, handkerchiefs, and numerous other articles worked in the most minute and elaborate designs, also jewellery, fancy articles, tea-caddies, and stationery.

Melbourne is a very handsome city. Its streets are finer and wider than those of London. It is distinguished for its University, museums, mint, public gardens, observatory, public library, and hospital. It is chiefly engaged in commerce, being an important port. It is situated in a fertile neighbourhood, the inhabitants of which are for the most part engaged in agriculture and grazing.

13.

N. Temperate Zone.	Tropical.	S. Temperate.
British Isles	Aden and Perim	S. African Colonies
Channel Islands	Hong Kong and Cowloon	S. part of Australia
Heligoland	S. India and Ceylon	Tasmania
Gibraltar	Burmah	New Zealand
Malta, Gozo, and Comino	W. African Settlements	Falkland Islands
Cyprus	St. Helena and Ascension	
N. India	Seychelle and Amirante Islands	
British N. America	Straits Settlements	
Part of Bahamas	Labuan & Sarawak	
	Singapore	
	Laccadive and Maldive Islands	
	W. Indies	
	N. part of Australia	
	British Guiana and Honduras	
	Fiji	

14. Starting on our journey from Aberdeen to London, we first travel to Carlisle by means of the Caledonian Railway. We first travel along the coast until we reach Stonehaven, noted for its granite. From thence we proceed to the ancient town of Forfar. Leaving there, we travel through a very hilly country, Strathmore, to Perth, beautifully situated on the Tay. The only town of any importance between here and Carlisle is Stirling, famous in Scottish history, but the scenery all along the route is very picturesque. Arriving at Carlisle we then travel to London by the London and North-Western Railway. Passing through Cumberland and Westmoreland we stop at Lancaster, the county-town of Lancashire, on the Lune, and Preston, both with cotton manufactures; also Wigan, noted for coal, in addition to cotton manufactures. We pass Crewe, an important railway centre, with locomotive works; Stafford, with manufactures of boots and shoes; Lichfield, the birthplace of Dr. Johnson; and Rugby, famous for its public school. Passing through Northamptonshire, we then travel through the pastoral and agricultural counties of Buckingham and Hertford; and, entering Middlesex, soon reach London.

Male Candidates.

SECOND YEAR.

Grammar.

1. Being thus invested with all the privileges of my office, and having enjoyed uncontrolled power over the exchequer as well as full enjoyment of all the other sweets of royalty, he at length came to regard himself as being actually the Duke; just as a person may tell a lie so often that in course of time he himself comes to believe it to be true. This arose from his having, in the capacity of regent, lived in royal state with full enjoyment of a Prince's privileges. His desire for absolute supremacy now became so inordinate that he determined no longer to merely play the part of Prince, but to be the Prince himself.

We all begged and implored you to turn from your purpose, and in the bosom of your own fair daughter there was a sharp conflict between her unwillingness to comply with your harsh command and her filial loyalty to yourself.

As the pleasure which some people derive from certain games compensates them over and over again for the considerable physical pain entailed, so there are those who will submit to shame and humiliation to gain a magnanimous object; and many are the great achievements which have had the humblest beginnings.

As I before told you would happen, the players in this representation have all completely vanished into space; and just as this unsubstantial show has faded away without leaving a shadow behind it, so the mightiest works of man, yea even the world itself and all its inhabitants will melt away into nothingness.

2. *To trash for overtopping.* *To lop* because they tower above the rest.

Come from thy ward. Abandon that attitude of defence.

The liberal arts. Those that belong to the head, as opposed to the *mechanical* arts which belong to the hands.

The red plague alludes to a plague common in Shakespeare's time; the extremities of those affected by it were red.

An eye of green. A slight shade of green.

A living drollery. A puppet show with living actors instead of dolls.

Ten leagues beyond man's life. An example of hyperbole, meaning ten leagues more than a man could accomplish in a life time.

Put to the foil. Here *foil* means a blunt sword. Thus the phrase means to disarm one's opponent and hence to defeat.

Pole-clipt vineyard. A vineyard where the vine plants cling tightly round the poles.

3.

Welkin	A.S. *wolcnu*, pl. of *wolcen*, a cloud.
Bootless	A.S. *bot* = advantage, profit; and *leas* same word as loose.
Inveterate	Lat. *inveteratus*, p. p. of *inveterare*, to retain for a long time; *vetus*, old.
Sorceries	O.F. *sorcerie* = casting of lots; Lat. *sortiare*, to cast lots; Lat. *sors*, a lot.
Gaberdine	Span. *gabardina* = coarse frock. Keltic word cognate with cabin.
Poison	Fr. *poison*; Lat. *potionem*, acc. of *potio*, a draught; *potare*, to drink.
Chirurgeon	Fr. word; Grk. *cheir*, the hand, and *ergein*, to work.
Flatlong	Icel. *flatra*, flat. *Long*, Icel. *linga* = wise, as in lengthwise.
Ecstasy	Grk. *ekstasis*; *ek*, out, and *istemi*, I place or stand.
Inchmeal	A.S. *ynce*; Lat. *uncia* an inch (or ounce); *meal*, A.S. *maelum*, dat. plur. of *mael*, a portion.
Hoodwink	A.S. *hod*, a hood, and *wincan*, to blink (= to make wink by putting on a hood).
Invest	Lat. *in*, into, and *vestis*, a garment.
Lieutenant	Fr. *lieu*, a place, and *tenant*, pres. part. of *tenir*, to hold. Lat. *locum tenentem*; *locus*, a place, and *teneo*, I hold.

4.

WORD	PREFIX	FORCE	ROOT MEANING OF WORD
Bestir	Be	Intensive	Thus bestir means 'to stir about a good deal'
Perdition	Per	Thoroughly or away	'placing away.'
Endowed	En	On	'bestowed upon.'
Prologue	Pro	Before	'A speech before hand'
Abjure	Ab	From	To swear from = 'to renounce on oath'
Subtleties	Sub	Under	'Finely woven' 'under a web.'

methinks = it seems to me. *Me* is dative governed by the 3rd person sing. of the impersonal verb *thin-can*, to seem.

5.

WORD.	OLD MEANINGS.	PRESENT MEANINGS.
Impertinent	Irrelevant	Saucy, rude
Complexion	The constitution or temperament	Quality of skin of face
Merely	Altogether, completely, simply	Only simply
Features	Bodily proportions generally	Characteristics of face
Proper	One's own, peculiar	Correct
Conduct	Conductor, leading (in passive sense)	Behaviour
Constant	Courageous, firm, continual	Continual
Control	Check, govern, contradict	Govern only
Fearful	Inspiring fear and feeling fear	Inspiring fear
Suggestion	A secret incitement, a hint	A first proposal
Observation	Observance, notice, performance of what is prescribed	Notice
Distemper	Disturbed state of mind, disorder, disease	A disease of a dog

6. 'In the dark *backward* and abysm of time. This is an example of Adverbs first used adjectively and then substantively 'Confederates with the King of Naples.' This is a unique use of the word. It means 'forms a secret league with.'

Grammatical peculiarity.	Example from 'Tempest.'
Double Comparison	I am more better than Prospero.
Mixed Construction	He *whom* next thyself Of all the world I loved, and to *him* put The manage of my state.
Use of shortened forms of the past participle and past tense	Instinctively have *quit* it There they *hoist* (for hoisted) us.
Use of redundant '*it*'	Will cry *it* o'er again
,, ,, *who* for *whom*	*Who* I have left asleep
,, ,, redundant pron. *me*	To do *me* business in the veins o' the earth.
,, ,, his for its	And peg thee in *his* knotty entrails.
,, ,, it for its	Of *it* own kind
,, ,, Double negative	This is no mortal business nor no sound That the earth owes.
,, ,, Sing. verb with Plur. Nom.	What cares these roarers for the name of King?

7. The plays of Shakespeare have been divided into two groups, viz.:—those written *before* and those *after* the death of Elizabeth.

In the early period he adheres more strictly to the line of 10 syllables and uses a number of rhyming lines.

In the latter period he takes more liberty with the metre, and uses many lines with an extra weak syllable.

Here too the development of character is higher; the plots are more skilfully formed, and the language more beautiful and striking.

The play must have been written after Florio's translation of Montaigne, published 1603, for in the passage of Gonzalo beginning with 'I' the commonwealth, I would by contraries, &c.,' there is a striking resemblance to a passage from that work.

The mention of 'The still-vexed Bermoothes' makes it probable that the 'Tempest' was written after the publication in 1610 of 'Jourdan's discovery of the Bermudas.'

The splendid development of character in Miranda and Prospero, the perfect versification, the resorting to the spirit world for characters, and the skill of the plot, show that the play was written when his powers were in their prime.

8. (*a*) *The skilful use of metaphor* 'The fair soul herself
Weighed between loathness and obedience at
Which end of the beam should bow.'

(*b*) The truth of nature as seen in the conduct of Miranda unaffected by the conventions of society, as shown in her outspoken love for Ferdinand, and her offer to carry the logs for him.

(*c*) The personification of inanimate objects and the use of language bordering on both clearness of meaning and indistinctness :—

'Where she at least is banished from your eye
Who hath cause to wet the grief on't.'
'Whose wraths to guard you from—
Which here, in this most desolate isle, else falls
Upon your heads—is nothing but heart-sorrow
And a clear life ensuing.'

Female Candidates.

SECOND YEAR.

Grammar.

A.

I have been wont to use at will you fairies who frequent the downs, streams, still lakes, and woods; and you who trackless advance and retire with the tide; you also, who by the light of the moon make the fairy rings of grass so sour that the sheep refuse them, and whose delight it is to produce in one night the mushrooms, and who dance with joy at the sound of the mournful curfew bell. Although you of yourselves have but feeble power, yet by my skill have I made you instrumental in obscuring the sun in his zenith, in raising the roaring tempest, and producing torrents of rain. I have made the lightning flash accompany Jove's awful peals, and have with his own weapon cleft asunder his favourite tree. By your aid have I made the firmly founded rocks quiver and uprooted the mightiest trees; yea even made the graves yield up their dead. But now I abandon for ever the violent use of this art and as soon as you have discoursed some divinely sweet music, to affect the minds of those for whom I intend it, I will destroy my wand and hurl my book of magic into the unfathomable deep.

Neptune is the God of the Ocean and thus personifies the sea.

Green-sour ringlets are circles of grass greener than the rest, and called fairy rings.

Fairies had their allotted times of the night, but none could begin their revels till after the curfew bell had rung.

I'll break my *staff*. The staff is the wand without which the magician's art fails.

B.

Thus by lightly esteeming all earthly pursuits and completely devoting myself to solitude and the cultivation of my intellect by studies which had they not rendered retirement necessary would have afforded me pleasure far preferable to popularity, I fanned into a flame the smouldering treachery of my evil-hearted brother. And just as noble spirited parents sometimes have evil children, so the absolute confidence I reposed in him was met with treachery as great in its opposite character as was my trust. Being thus invested with all the privileges of my office, and having uncontrolled power over the exchequer and full enjoyment of all the other sweets of royalty, he at length came to regard himself as being actually the Duke, just as a person may tell a lie so often, that in course of time he himself comes to believe it true. This arose from his having, in the capacity of regent, lived in royal state with full enjoyment of a prince's privileges and authority. His thirst for power therefore increased. Are you listening?

Mir. Your story, Sir, is interesting enough to make the deaf hear it.

Pros. Dissatisfied with merely acting the part of prince he determines to be nothing less than the Duke of Milan himself: as for me, well, my study was province quite large enough; regarding me as incompetent to rule, in his greediness for power, he enters into a secret treaty to pay the King of Naples yearly tribute, to become his vassal, to make his dukedom tributary to Naples, and (alack for my dear city), thus submitted Milan, which never yet had acknowledged foreign sway, to the basest servility.

Dedicate—Lat. *dedicatus*, is really a past participle.

Rate—Lat. *reor, ratus*, I think, means opinion.

Sans—French preposition then in frequent use, meaning without.

Who has no verb to which it is Nominative owing to the poet having changed the construction he began with.

Confederates—a unique use of the word; it here means 'forms a secret league.'

Coronet and Crown—Milan is represented by the diminutive in irony, as Antonio had subjected it to Naples.

1. The Tempest opens with the wreck of the ship by which Alonzo the King of Naples was returning from Tunis where he had harshly married his daughter to the Prince of Tunis. The lawful Duke of Milan, Prospero, had been cast from the hulk on which he and his daughter had been placed, on to a small island which he took as his own, submitting to himself an ill-formed half-man-half-demon, Caliban. His studies are here of the greatest service to him for by them he subdues to his will the spirits of the air, the chief of which is Ariel. The shipwreck had been caused by his art, but all were saved though divided into groups over the island, each ignorant of the other's safety. Ferdinand the son of the King of Naples is the first to fall into the hands of Prospero, who makes him carry logs; while Ferdinand is engaged in this work, Miranda, the daughter of Prospero, who had never before within her recollection seen a man except her father, encounters him and falls in love with him at first sight. After testing Ferdinand's affection for his daughter, Prospero blesses their betrothal. Meanwhile Antonio and Sebastian, two base brothers, plan the death of Alonzo, but Prospero by the instrumentality of Ariel prevents it. At length all are brought into the presence of Prospero who, having used his art as far as was necessary for his purpose, nobly abstains from revenge. Alonzo regrets his ignoble conduct, blesses his son and Miranda, restores the independence of Milan, while Prospero exposes the treachery of his own and of Alonzo's brother. Gonzalo the faithful courtier who did as much as he dared to save Prospero, and who throughout plays a noble part, is honoured by Prospero. All return to Italy, where Ferdinand and Miranda marry.

This play is decidedly a comedy inasmuch as the end is a happy one, no one is killed, and very much humour is introduced by the characters of the boatswain, Trinculo, and Stephano.

The shipwreck of a fleet fitted out by the 'Adventurers and Company of Virginia' on the island of Bermudas called the 'Isle of Devils.' This probably suggested the opening scene and the Spirits which inhabited the island.

The stories of the impositions practised by those who returned from colonization were suggested by the curiosities reported to have been seen by those who had attempted to colonize Virginia.

2. The Tempest has been assigned to the latter part of Shakespeare's literary career. Gonzalo's description of his ideal commonwealth is evidently based on a passage from 'Florio's translation of Montaigne' which did not appear till 1603.

The mention of the still-vexed Bermoothes makes it probable that the Tempest was written after the publication in 1610 of 'Jourdan's discovery of the Bermudas.'

The beauty of the diction, perfection of versification, and the resorting to the spirit world for characters show clearly that this drama was written when the poet's genius was mature.

3. *Metaphor* 'If you but knew how you *the purpose cherish*.'
'*To ebb* hereditary *sloth instructs me*.'
Simile 'Nor lead me, *like a firebrand*, in the dark.'
'And my trust *like a good parent* did beget of him.'
Hidden Simile 'The strongest oaths are straw to the fire in the blood.'
Personification 'Hence bashful cunning!
And prompt me, plain and holy innocence!'
Hyberbole 'Ten leagues beyond man's life.'
Metonymy 'Hast thou which art but air, a *touch*, a feeling.'
(A *touch* stands for the sensation caused by touching.)
'Which, but three *glasses* since.'

4. *Prospero* is a man of retiring and studious habits, trusting, and possessing perfect self control. Although his conduct on the island appears harsh, yet that harshness is only carried to a necessary extent and as soon as the necessity for it ceases he abstains from vengeance and displays the greatest magnanimity. His energies are roused by the feeling that he had by his carelessness ruined the fortunes of his daughter, and thus his wonderful energy is the strenuous effort of the loving father to compensate for his past neglect.

Miranda is a beautiful representation of unconventional purity. Her life was one of filial devotion and the fortitude she displayed had enabled her father to bear up under his sore affliction. Her declaration that she would be the wife of Ferdinand if he would have her was not immodest in Miranda, for Ferdinand could not in his position have made an offer to the daughter of his hard task-master. She very naturally disobeys her father where she reveals her name, but she immediately recollects herself and regrets the disobedience. Her heart is full of compassion as is shown in her concern for the shipwrecked mariners, her sympathy with Ferdinand and her grief at the story of Prospero. She is sincerely *grateful* as is seen in her 'would I might but ever see that man!' when Prospero tells her of Gonzalo's goodness to them.

Gonzalo, a good and faithful counsellor, loyal in his first master's misfortune, yet prudent enough to abstain from useless opposition which would have prevented his further usefulness to his patron. He shows his benevolent nature again in his attempt to cheer Alonzo on the ship in the storm and afterwards on the island. Prospero says of him that his 'honour cannot be measured or confined.'

Caliban, (an analogue of the word cannibal,) is a demi-devil born of the witch Sycorax. The kindness of Prospero fails to call forth his gratitude, but on the contrary the brute attempts to violate his master's daughter. In his animal nature he is ready to worship the drunken butler that gives him spirits, but hates the man that attempts to educate and refine him.

5. (*a*) The retrospective narrative by Prospero where in the heart of Prospero is represented a splendid conflict between parental love and righteous indignation and anger.

(*b*) The love-scene between Ferdinand and Miranda. The character of Miranda here is a wonderful production of fancy, yet perfectly true to nature.

(*c*) The *masque* is inimitable; here he resorts to the spirit world for his players, and the whole of the representation testifies to Shakespeare's splendid powers of imagination.

(*d*) The soliloquy where Prospero abjures magic and withholds revenge. This conduct is consistent with the early character of Prospero and testifies to the intuitive knowledge that the poet had of the most secret workings of the human heart.

Male Candidates.

SECOND YEAR.

Mensuration.

1. Volume of Pyramid

$$= \frac{\text{area of base} \times \text{perp. height from centre of base}}{3}$$

Area of base = 14,400 sq. ft. ∴ length of side of square base = 120 ft.

∴ diagonal of base = $120 \times \sqrt{2} = 169{\cdot}70$ ft.

perpendicular height = $\sqrt{(\text{length of edge})^2 - (\frac{1}{2}\text{ diagon. of base})^2}$

$= \sqrt{100^2 - (84{\cdot}85)^2}$

$= \sqrt{(100 + 84{\cdot}85) \times (100 - 84{\cdot}85)}$

$= \sqrt{184{\cdot}85 \times 15{\cdot}15}$

$= \sqrt{2800{\cdot}4775}$

$= 52{\cdot}92$

∴ vol. of pyramid $= \frac{14400 \times 52{\cdot}92}{3} = 14400 \times 17{\cdot}64$ cub. ft.

$= \underline{254{,}016 \text{ cub. ft.}}$ Ans.

2. The weights will be proportional to the volumes.

The greatest diameter the sphere can have = length of side of cube.

Let a be the length of the side of the cube.

Then vol. of cube $= a^3$

and vol. of sphere $= \frac{\pi a^3}{6}$ where $\pi = 3{\cdot}1416$

$= a^3 \times {\cdot}5236$

$\therefore \frac{\text{weight of sphere}}{\text{weight of cube}} = \frac{{\cdot}5236}{1} = \frac{5236}{10{,}000}$.

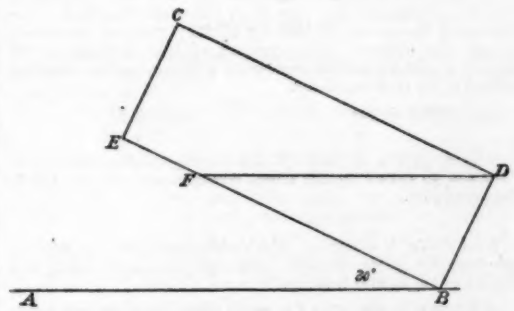
3. Vol. of cylinder = height × area of base.

$= 20 \times \pi 9^2 = 20 \times \frac{22}{7} \times 81$ cubic ft.

$= 20 \times \frac{22}{7} \times 81 \times 1728$ cubic inches.

∴ No. of gallons contained

$$= \frac{\overset{10}{\cancel{20}} \times 22 \times 81 \times 1728}{7 \times \underset{138{\cdot}637}{277{\cdot}274}} = \underline{31{,}730{\cdot}04}.$$



4. Let AB be the ground line, and CEBD the parallelopiped tilted up so that the ∠ EBA is an ∠ of 30°.

Let FD represent a line in the surface of the water when the water is at rest.

Then FD is parallel to AB.

∴ ∠ DFB is an ∠ of 30°.

But ∠ FBD is a right ∠ (hyp.). ∴ ∠ FDB is an ∠ of 60°.

Now in any △ whose angles are respectively 90°, 60°, 30°, the hypotenuse = base × 2, and the perpendicular on the base = base × $\sqrt{3}$. Thus FD = 2 DB and FB = DB × $\sqrt{3}$.

But by the question DB = $4\sqrt{3}$.

∴ FB = $4\sqrt{3} \times \sqrt{3} = 4 \times 3 = 12$.

But EB = 12 by the question. ∴ F coincides with E, and the surface of the water forms a plane bisecting the parallelopiped.

∴ When tilted the trough holds one half as much as when lying flat on the ground.

i.e. $\frac{12 \times 8 \times 4\sqrt{3}}{2}$ cubic feet = 332·544 cub. ft.

Female Candidates.

SECOND YEAR.

Arithmetic.

1. (*a*) Write down the divisor to the left of the dividend, placing a mark of separation on each side of the dividend.

(*b*) Beginning at the left hand side of the dividend, see how many times the divisor is contained in the least number of figures which contain the divisor, and write down this number of times in the quotient to the right of the dividend.

(*c*) Multiply the divisor by the quotient obtained and subtract the product from the figures used in obtaining the quotient.

(*d*) To the remainder bring down the next figure in dividend. If the remainder thus increased is less than the divisor write a cipher in quotient and bring down next figure; but if greater repeat the process in (*c*).

(*e*) This is to be continued until all the figures in dividend are brought down. The figures in quotient represent the number sought; the undivided number is remainder.

3379 divides into 1,169,134 in round numbers 300 times. After the 3 generally written, an indefinite number of ciphers corresponding with the number of figures remaining in the dividend is understood. It all comes from the fact that a digit to the right is 10 times less than that same digit in the next place to the left.

3379)1169134(300 + 40 + 6
1013700
155434
135160
20274
20274

A remainder of 155434 is left into which 3379 divides in round numbers 40 times, leaving 20274. Into 20274, 3379 divides 6 times with no remainder. ∴ 3379 divides into the whole 300 + 40 + 6 times = 346 times.

A number of figures corresponding with the number of ciphers is retained at the right hand side of the dividend. The remaining figures are divided by all the figures of the divisor except the ciphers. The quotient of this division is the answer required; and the remainder with the retained numbers affixed is the true remainder.

e.g.—22958 ÷ 300 3,00)229,58
76+158

3 is contained in 229, 76 times with 1 for a remainder. Affix the 58 cut off to the 1 that remained and we get 158 as the remainder.

2. *A Factor* is a number which when multiplied by another produces the given number. Because 3 × 4 = 12, 3 is a Factor of 12, as also is 4.

A Power of a number is the result when the given number is multiplied by itself anynumber of times. Because 27 = 3 × 3 × 3, 27 is a power of 3.

Numeration is the process of assigning names to, or of reading numbers.

A Prime Number is one which has no other factors but itself and unity as 19.

A Composite Number is one which is the production of two factors other than itself and unity. 20 = 4 × 5. ∴ 20 is a composite number.

The G. C. M. of numbers is the greatest number which divides each of those numbers without a remainder *e.g.* 12 is G. C. M. of 24, 36 and 108.

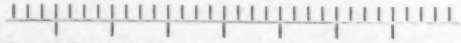
A Root is the number which when multipled by itself a given number of times produces the given number. Because 2 × 2 × 2 × 2 = 16, 2 is fourth root of 16.

Ratio is the comparison of two numbers in respect of magnitude made by stating how many times or parts of a time the first contains the second. 5 : 8 or $\frac{5}{8}$ is a ratio.

3. (*a*) *To multiply a fraction by a whole number*, multiply the numerator by that number and retain denominator, which simply tells the name or value of the numerator.

Multiplication is only another form of addition. So in multiplying $\frac{3}{7}$ by 8 we are really adding $\frac{3}{7} + \frac{3}{7} + \frac{3}{7} + \frac{3}{7} + \frac{3}{7} + \frac{3}{7} + \frac{3}{7} + \frac{3}{7}$. By the rule for addition we know that is $\frac{24}{7}$. Hence the rule.

(*b*) *To divide a fraction by a whole number*, multiply the denominator by that number and retain numerator.



If a unit be divided into 32 parts it is plain from the example that each will be only $\frac{1}{32}$ as great as when the unit is divided into 8 parts *i.e.* $\frac{1}{8} \div 4 = \frac{1}{32}$ and any number of 8ths divided by 4 gives the same number of 32nds. *e.g.* $\frac{5}{8} \div 4 = \frac{5}{32}$. Hence Rule.

4. Divide the numerator by denominator affixing as many ciphers as are necessary to make the division possible. Mark off in quotient from right to left the same number of decimal places as were added of ciphers in obtaining that quotient.

e.g. Reduce $\frac{3}{16}$ to a decimal.

16)3·0(·1875
16
140
128
120
112
80
80

The division of 3 by 16 is not possible; add a cipher. Continue this till there is no remainder. Four noughts were used. ∴ there are four decimal places.

Reason of process.—In the decimal system every figure represents either unity, or 10, or some power of 10, or $\frac{1}{10}$ or some power of $\frac{1}{10}$. When I have to change $\frac{3}{16}$ to a decimal I have to reduce it to a fraction with a denominator like one of the above. Now $\frac{3}{16}$ is less than unity; let us see then how many tenths it is equal to. That is, let us reduce $\frac{3}{16}$ to a fraction with 10 instead of 16 for its denominator.

Let x represent the new numerator.

Then $\frac{3}{16} = \frac{x}{10}$ *i.e.* $30 = 16x$ *i.e.* $x = \frac{30}{16} = 1\frac{14}{16} = 1\frac{7}{8}$

∴ $\frac{3}{16} = \frac{1\frac{7}{8}}{10}$ *i.e.* $\frac{1}{10}$ and $\frac{7}{8}$ of $\frac{1}{10}$

But $\frac{1}{10} = ·1$ and $\frac{7}{8}$ of $\frac{1}{10} = \frac{7}{80}$

Now $\frac{7}{80}$ is less than $\frac{1}{10}$; let us see how many hundredths it equals. Repeating the process as before.

$\frac{7}{80} = \frac{x}{100}$ ∴ $700 = 80x$ ∴ $x = \frac{700}{80} = 8\frac{3}{4}$

∴ $\frac{7}{80} = \frac{8\frac{3}{4}}{100} = \frac{8}{100} + \frac{3}{4}$ of $\frac{1}{100}$

But $\frac{8}{100} = ·08$, and $\frac{3}{4}$ of $\frac{1}{100} = \frac{3}{400}$.

$\frac{3}{400}$ is less than $\frac{1}{100}$; let us see how many thousandths it equals.

$\frac{3}{400} = \frac{x}{1000}$ ∴ $x = \frac{3000}{400} = \frac{7\frac{1}{2}}{1000} = \frac{7}{1000} + \frac{1}{2}$ of $\frac{1}{1000}$

But $\frac{7}{1000} = ·007$ and $\frac{1}{2}$ of $\frac{1}{1000} = \frac{1}{2000}$.

But $\frac{1}{2000} = \frac{5}{10000} = ·0005$ with no further addition.

Thus $\frac{3}{16} = ·1 + ·08 + ·007 + ·0005 = ·1875$ and it has been obtained by dividing the numerator by the denominator.

$$\frac{3\frac{1}{13} \text{ of } £3\ 12s.\ 6\frac{3}{4}d.}{£35\ 0s.\ 3\frac{3}{4}d.} = \frac{£3\ 12s.\ 6\frac{3}{4}d. \times 172}{\frac{45}{5} \times £35\ 0s.\ 3\frac{3}{4}d.}$$

8s. $0\frac{3}{4}$d.

$$= \frac{16641}{420184} = \frac{\text{etc.}}{\text{etc.}}$$

= ·39603, &c.

·39603, &c. Ans.

5. The time of publication lasts (1584 × 7) + 1 days = 11089 days or $30\frac{1049}{1461}$ = 30 yrs. 139 dys. So No. 1 will have appeared before 1848.

From 139 days we must take the days in 1879 viz. 13 + 28 + 31 or 72.

139 − 72 = 67

There will be 7 leap years between 1848, ∴ the number of days No. 1 appeared before end of 1848 is 67 − 7 = 60

i.e. 60 − 31 = 29 days before beginning of December, *i.e.* on the 2nd of November.

November 2nd, 1848. Ans.

6. *An Average* is an equal distribution of unequal quantities or that quantity which may be substituted for each one of a set of different quantities without altering the sum of the set.

Rule.—Add all the quantities together. Divide the sum by the number of quantities.

9 average $28\frac{1}{4}$ ∴ the total ages of 9 = $256\frac{1}{4}$
3 ,, $38\frac{3}{4}$ ∴ ,, ,, 3 = $116\frac{1}{4}$
8 ,, 61 ∴ ,, ,, 8 = 488
7 ,, 75 ∴ ,, ,, 7 = 525
∴ the total age of the whole club = $1385\frac{3}{4}$
∴ the average age of 27 = $51\frac{53}{108}$ yrs.

$51\frac{53}{108}$ yrs. Ans.

7. As $\frac{1}{2} : \frac{3}{4} : \frac{1}{5}$. Reduce these fractions to the L.C.D. Then we have $\frac{10}{20} : \frac{15}{20} : \frac{4}{20}$ thus these ratios $= 3 : 4 : 1$; $3 + 4 + 1 = 8$.

$\therefore$ A's share $= £\frac{5 \text{ 5s.} \times 3}{8} = £1$ 19s. $4\frac{1}{2}$d.

B's share $= £\frac{5 \text{ 5s.} \times 4}{8} = £2$ 12s. 6d.

C's share $= £\frac{5 \text{ 5s.} \times 1}{8} =$ 13s. $1\frac{1}{2}$d.

£1 19s. $4\frac{1}{2}$d., £2 12s. 6d. and 13s. $1\frac{1}{2}$d. Ans.

8. Frequently in common life 100 is taken as a standard and other numbers are compared with it. We say a man pays 5 °/₀ interest, *i.e.*, for every £100 he borrows he pays £5. A soldier shoots and misses the target 80 °/₀ of the times he shoots, *i.e.*, for every 100 shots he misses 80.

20 : $1\frac{1}{2}$ :: 100 : percentage reqd.

$\therefore$ per cent. reqd. $= \frac{3 \times \overset{5}{\cancel{100}}}{2 \times \cancel{20}} = 7\frac{1}{2}$ °/₀

1 ton : 1 qr. $15\frac{3}{4}$ lbs. :: 100 : percentage reqd.
i.e., 2240 lbs. : $43\frac{3}{4}$ lbs. :: 100 : percentage reqd.

$\therefore$ per cent. reqd. $= \frac{\overset{5}{\cancel{100}} \times 175}{4 \times \underset{112}{\cancel{2240}}} = \frac{875}{448} = 1\frac{427}{448}$ °/₀ $= 1\frac{61}{64}$ °/₀

1 ton : 2 lbs. $12\frac{1}{2}$ oz. :: 100 : percentage reqd.
i.e., 35840 oz. : $44\frac{1}{2}$ oz. :: 100 : percentage reqd.

$\therefore$ per cent. reqd. $= \frac{\overset{1}{\cancel{2}} \times \overset{1}{\cancel{100}} \times \cancel{224}}{\underset{1}{\cancel{5}} \times \underset{\cancel{100}}{35840}} = \frac{1}{64}$ °/₀

$7\frac{1}{2}$ °/₀, $1\frac{61}{64}$ °/₀, and $\frac{1}{64}$ °/₀. Ans.

9. For every 12 spaces of the minute hand the hour hand goes 1 $\therefore$ the minute hand gains 11 spaces on hour hand in going round the face.

At 6 o'clock they will be in a straight line with each other.

At 7 o'clock the minute hand will be a space behind.

At 7 o'clock $+ \frac{60}{11}$ mins., *i.e.*, at $5\frac{5}{11}$ mins. past 7 they will be opposite.

At 9 o'clock the minute hand will be three spaces behind.

At 9 hrs. $+ \frac{60 \times 3}{11}$ mins., *i.e.*, at 9 hrs. $16\frac{4}{11}$ mins. they will be opposite.

$16\frac{4}{11}$ mins. past nine. Ans.

10. At the present moment the worth of a sum of money lent is not so great as it will be afterwards, at the time in the future when it is due. A man paying a debt now would not expect to pay so much as a man who had the use of the money still for some time to come. Discount is money allowed for the payment of a debt before it is due.

A sum of £101 is discounted at 3 months @ 4 °/₀. Then P.W. of £101 $=$ £100 and dis. $=$ £1.

i.e., dis. $=$ £101 (given sum) $-$ £100 (P.W.)
P.W. $=$ £101 (given sum) $-$ £1 (dis.)
$102\frac{1}{2} : 127\frac{1}{10}$ :: $2\frac{1}{2}$: dis. reqd.

$\therefore$ dis. reqd. $= \frac{\overset{1}{\cancel{2}}}{\underset{5}{\cancel{205}}} \times \frac{\overset{31}{\cancel{1271}}}{\underset{2}{\cancel{10}}} \times \frac{\overset{5}{\cancel{5}}}{\underset{1}{\cancel{2}}} = \frac{31}{10} =$ £3 2s.

£3 2s. Ans.

11. *Interest* is money paid for the use of money lent.

In the case of *Compound Interest*, the interest is retained year by year and added to the Principal, interest being paid on the increased Principal at the same rate as on the previous Principal.

Case I. A = amount, P = £840, R = A of £1 for $\frac{1}{2}$ yr. = 1·025, n = 6

A = PR^n
$= £840 \times (1{\cdot}025)^6$
$= £974{\cdot}142479 +$

Case II. A = amt., P = £840, R = 1·02, n = 8

A = PR^n
$= £840 \times (1{\cdot}02)^8$
$= £840 \times (1{\cdot}0404)^4$
$= £840 \times 1{\cdot}171659 +$
$= £984{\cdot}19388 +$

£984·19388 − £974·142479 = £10·0514 + diff.
The latter is greater by £10·0514 +. Ans.

12. $1\frac{1}{2} : 2$ :: 100 : amount insured.

Amount insured $= \frac{\overset{50}{\cancel{100}} \times \overset{1}{\cancel{2}} \times 3}{\underset{1}{\overset{\cancel{4}}{\cancel{2}}}} =$ £150 $=$ B's insurance

Amt. on £25 for 6 yrs. @ 4 °/₀ S.I. $= \frac{124 \times 25}{100} =$ £31

" " 5 " " $= \frac{120 \times 25}{100} =$ £30
" " 4 " " = £29
" " 3 " " = £28
" " 2 " " = £27
" " 1 " " = £26
Total Sum at end of 6 yrs. = £171.

£171 − £150 = £21, amt. A will bequeath more than B.

£21. Ans.

13. The 3 per cents. are at a discount, means that they are below par., that is, £100 stock may be bought for less than £100 in money.

£$87\frac{1}{2}$: £$2613\frac{3}{4}$ :: £3 : income required.

$\therefore$ Income from 3 °/₀ $= \frac{3 \times \overset{15}{\cancel{10455}} \times \overset{2}{\cancel{8}}}{\underset{1}{\overset{\cancel{4}}{\cancel{2}}} \times \underset{1}{\cancel{697}}} =$ £90.

£125 : £$2613\frac{3}{4}$ :: £$4\frac{1}{2}$: income required

$\therefore$ Income from $4\frac{1}{2}$ °/₀ $= £\frac{9 \times \overset{2091}{\cancel{10455}}}{4 \times 2 \times \underset{25}{\cancel{125}}} = £1\frac{2091}{200}$
$=$ £94 1s. $10\frac{1}{4}$d.

£94 1s. $10\frac{1}{4}$d. − £90 $=$ £4 1s. $10\frac{1}{4}$d.

$4\frac{1}{2}$ °/₀ are better investment by £4 1s. $10\frac{1}{4}$d. Ans.

14. *Stock* is the name given to funds which constitute national debts. These funds were borrowed at different times and at a certain rate of interest then agreed on.

$\frac{1}{2} : 45$ :: £100 : purchase money
$\therefore$ P.M. $= 8 \times 45 \times 100 =$ £36000
$\frac{1}{10} :$ £45 :: £100 : nominal value
$\therefore$ Nom. value $= 45 \times 100 \times 10 =$ £45000
45000 : 36000 :: £100 : price of £100 stock.

$\therefore$ price of £100 stock $= \frac{36000 \times 100}{45000} =$ £80

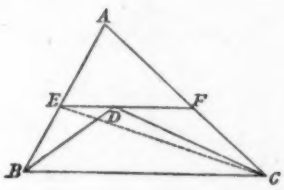
£45000 and £80. Ans.

Male Candidates.

SECOND YEAR.

Euclid.

1. (*a*) Prop. I. 37.



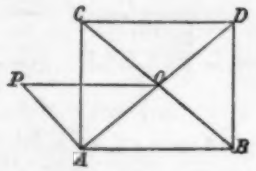
(*b*) Let the triangle ABC be double the triangle BDC, and draw EF parallel to BC.
Join CE. Then the triangle BEC $=$ triangle BDC.

∴ Triangle BEC = ½ triangle ABC = triangle AEC.

And because the triangles BEC, AEC are equal, the base BE = base AE.

∴ AB is bisected in E. Similarly it may be shown that AC is bisected in F.—Q. E. D.

2. (*a*) Prop. I. 46.

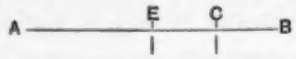


(*b*) Let AB be the given line, and ACDB the square described on it.

Join AD, CB, meeting at O, and draw OP parallel to BA and AP parallel to BO. POBA is the rhombus required.

For the diagonals divide the square into four equal parts, and the parallelogram POBA is double the triangle AOB, *i.e.*, it is equal to ½ the square ACDB.—Q. E. F.

3. (*a*) Prop. II. 5.



(*b*) Let AB, the given straight line, be bisected at E.

Bisect EB at C.

Then the rect. AC, CB = ¾ square on AE.

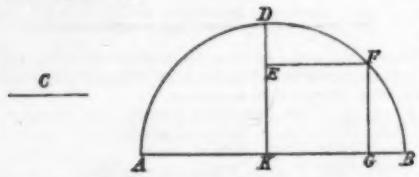
For by Prop. II. 5 (above) rect. AC, CB + square on EC, = square on AE.

∴ rect. AC, CB = square on AE, less the square on EC.

But square on EC is ¼ square on EB, because EC = CB (II. 5.).

∴ the rect. AC, CB = ¾ square on AE.—Q. E. F.

4. (*a*) Prop. II. 14.



(*b*) Let AB be the given straight line, and C the second given straight line, which is not greater than ½ AB.

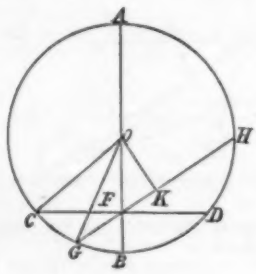
Bisect AB at R, and describe the semicircle ADB.

Draw KD at right angles to AB, and from it cut off KE = C. Draw EF parallel to KB and FG parallel to EK, meeting AB at G.

Then the rectangle AG, GB = square on GF = square on EC = square on C. (II. 14.)

∴ the given straight line AB is divided at G in the manner required.—Q. E. F.

5. (*a*) First part of III. 3.



(*b*) Let AB, the diameter, bisect CD at right angles at F, CD shall be shorter than any other chord, GH passing through F.

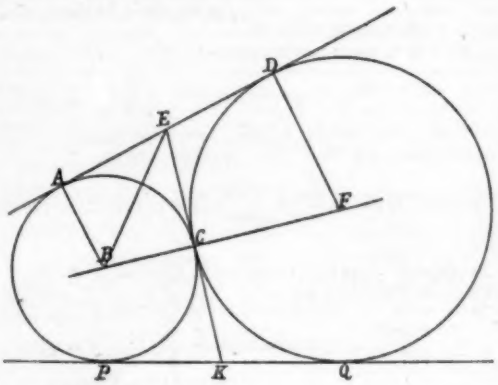
From O, the centre of the circle, draw OK at right angles to GH, and join OC, OG. Then GH is bisected at K (III. 3.).

And in the triangle OFK, OKF is a right angle, and it is therefore greater than OFK.

∴ the side OF is greater than OK.

Then in the right-angled triangles OCF, OGK, OC = OF, and OF is greater than OK, therefore CF is less than GK. And CF is ½ CD, and GK is ½ GH. ∴ CD is less than GH.—Q. E. D.

6. (*a*) First part of III. 17.



(*b*) Let the circles touch each other at C, and let EK, AD, PQ, be the tangents, and B, F, the centres of the circles.

Join BA, FD, and BE.

Then in the right-angled triangles ABE, BCE.

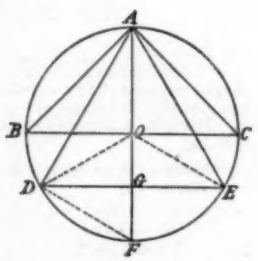
AB = BC, and BE is the common hypotenuse.

∴ AE = EC. In the same way it may be shown (by joining EF) that DE = EC.

∴ AE = DE and AD is bisected at E.

Similarly, it may be shown that PQ is bisected at K.—Q. E. D.

7. (*a*) Prop. III. 29.



(*b*) Let O be the centre of circle, and AF, BC, two diameters bisecting each other at right angles. Complete the figure as shown, making ADE the equilateral triangle.

Then ABC is the right-angled isosceles triangle having the right angle BAC. Then because DE subtends ⅓ of the circumference, and BA subtends ¼ of it ∴ DE is greater than AB.

And it may easily be shown by joining OD, OF, OE that OF is bisected in G. Therefore OG = ½ AO.

Now square on AG = square on AO + square on OG + twice rect. AO, OG, and twice rect. AO, OG = square on AO (because OG = ½ AO).

∴ square on AG = twice square on AO + square on OG.

And square on AC = twice square on AO (I. 47).

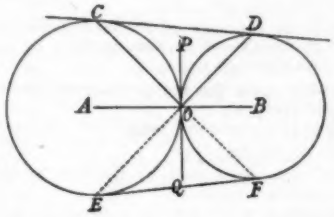
∴ AG is greater than AC.

Now the triangle ABC = ½ rect. AC, AB, and the triangle ADE = ½ rect. AG, DE.

And since it has been shown that DE is greater than AB, and that AG is greater than AC, much more then is the rect. AG, DE greater than the rect. AC, CB.

∴ the equilateral triangle ADE is greater than the isosceles triangle ABC.—Q. E. D.

8. (*a*) Prop. III. 32.



(*b*) Let the circles touch at O, and let CD and EF be the tangents touching at C, D, and E, F. Then COD and EOF shall be right-angled triangles. Draw the common tangent POQ.

Because CD touches the circle at D the angle CDO = the angle in the segment DFO; and because PQ touches the circle at O the angle POD = the angle in the segment DFO;

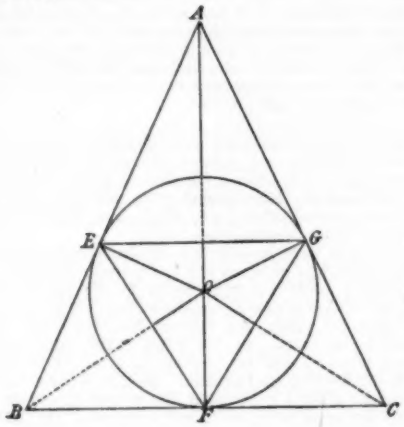
∴ the angle CDO = angle POD.

In the same way it may be shown that the angle DCO = the angle POC.

∴ the whole angle COD = the angles CDO, DCO, and therefore it is a right angle.

Similarly it may be shown that EOF is a right angle.—Q. E. D.

9. (*a*) Prop. IV. 4.



(*b*) As the triangle is equiangular, the 6 angles formed by bisecting the 3 angles of the triangle are equal to one another.

∴ in the triangle AOB, AO = OB.

And because in triangles AOE, EOB, AO = OB, and the angles AEO, BEO are right angles (AB being a tangent to the circle), ∴ AE = EB.

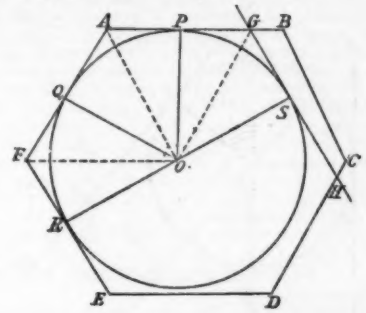
In the same way the other sides are bisected at F and G. And because in triangle EBF, EB = EF, and angle EBF = ⅔ of a right angle,

∴ the triangle is equilateral, and EF = BF.

In this way it may be shown that the whole triangle ABC is divided into 4 equal and equilateral triangles.

∴ EFG is ¼ the whole triangle.—Q. E. D.

10. (*a*) Prop. IV. 15.



(*b*) Let the circle touch the sides BA, AF, FE of the regular hexagon ABCDEF at the points P, Q, R, it shall also touch the other 3 sides. For if not let BC be a side which does not touch it.

Join OR, OQ, OP. Produce RO to meet the circumference at S, and join OF, OA. At S draw the tangent GH.

Then it may be shown by reasoning similar to that employed in IV. 13, that AP = AQ, and that AO bisects angle BAF, and that OF bisects angle AFE.

∴ OA = OF, and consequently AF is bisected at Q. ∴ also AB is bisected at P.

And because OSG is a right angle, ∴ angle PGS = angle FAB.

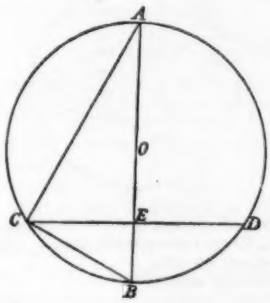
And ∴ angle PGS = angle PBC; ∴ GH is parallel to BC, and therefore AB (or AB produced) will meet GH: let them meet at G.

Then it may be shown that (by joining OG) AG is bisected at P. ∴ AP = PG

But AP = PB.

∴ PG = PB, which is absurd. Wherefore, &c.—Q. E. D.

11. (*a*) Prop. VI. 8.

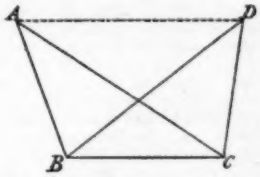


(*b*) Let the diameter AB bisect the chord CD at right angles at the point E. The square on CE shall be equal to the rect. AE, EB.

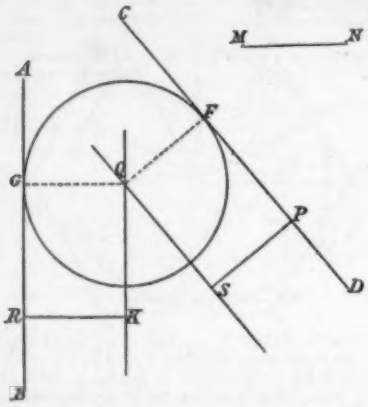
Join AC, CB, then ACB is a right angle, and by p. VI. 8, AE is to EC as EC is to EB.

Therefore EC is a mean proportional between AE and AB, and ∴ the square on CE = rect. AE, EB.—Q. E. D.

12. (*a*) Prop. VI. 15.



(*b*) This follows directly from I. 39, for 'equal triangles upon the same base, and on the same side of it, are between the same parallels.'



13. Let AB, CD, be the two given straight lines (which are not parallel), and MN the given radius.

Take any point P in CD, and on the side of CD towards AB, draw PS at right angles to CD and equal to MN. Similarly draw RK at right angles to AB and equal to MN.

Through S draw SQ parallel to DC, and through K draw KQ parallel to BA.

Then because AB is not parallel to CD, KQ is not parallel to SQ. Therefore, these lines, if produced, will meet; let them meet in Q. Q is the centre of the circle required.

For draw QF at right angles to CD, and QG at right angles to AB. Then QFPS is a parallelogram, and QF = SP = MN, and similarly QG = KR = MN.

∴ QF = QG,

And QF is at right angles to CD, and QG to AB;

∴ the circle described from point Q with radius QF will touch the straight lines AB and CD at the points G and F.—Q. E. F.

14. It is obvious that there is an error in the enunciation of this proposition, for no three parallel chords can be drawn in a circle without cutting SIX arcs.

Therefore a proof is impossible.

Female Candidates.

SECOND YEAR.

British History.

1. Simon de Montfort, Earl of Leicester, came into prominence at the time of Henry III.'s quarrel with the barons. He had married the king's sister Eleanor, widow of the Earl of Pembroke; had governed Gascony for some years with vigour and success, and had now (1258) returned dissatisfied with the king. He was dissatisfied because Henry had not sufficiently supported him while in Gascony, and also because of the king's action in regard to the jointure or legacy belonging to his (Montfort's) wife. Montfort put himself at the head of the barons, who objected to the king's illegal measures and non-observance of the Great Charter, which he had signed. On June 11th, Parliament met at Oxford, and the barons attended fully armed, accompanied by their retainers. The king was powerless; a council of twenty-four barons was selected to make the necessary reforms. At the head of this council was Simon de Montfort, who next secured the enactments called the 'Provisions of Oxford.' Writs were issued by Montfort, in the king's name, summoning a new Parliament in London. This was after the Battle of Lewes, in which Montfort had defeated the royalists, taking Henry and his eldest son Edward prisoners (1264). To this Parliament he summoned two knights from each shire, and two representatives from each borough, thus framing the first House of Commons (1265). Soon after, Prince Edward escaped. He gathered an army of great strength (the people having become tired of the domination of the barons), and met Montfort at Evesham. In this severe battle, Montfort, his eldest son, and about 160 knights (1265) were slain.

2. Richard I. raised money for his crusade thus:—

(1) He sold the revenues and manors of the crown, and the offices of greatest trust and power.

(2) He sold the vassalage of Scotland, together with the fortresses of Roxburgh and Berwick, acquired by his father in the course of his victorious reign.

The following were the ordinary sources of the King's revenue at that time:—

(1) Royal demesnes or crown lands.

(2) The Danegeld tax.

(3) Reliefs, *i.e.*, fines paid by the heir to his lord on succeeding to a fief.

(4) Forfeitutes, *i.e.*, fines paid by a vassal failing to perform his duties towards his lord.

(5) Fees paid in respect of wardship and marriage.

3. In the time of Henry II. Irish affairs were in the greatest confusion. Besides many small tribes, there were five principal sovereignties in the island:—Munster, Leinster, Meath, Ulster, and Connaught. The kings of these provinces were continually quarrelling, and often invaded one another's territory. Sometimes one king was paramount, sometimes another. Roderick O'Connor, King of Connaught, was in the ascendant at this period.

Henry had applied to the Pope (Adrian IV.) for a bull to give him authority over Ireland. The Pope, who considered that the disposal of kingdoms and empires rested with him, gladly gave Henry a bull, granting him entire right and authority over the country. On this bull, Henry rested his claims.

Dermot Macmorrogh, King of Leinster, had carried off the wife of O'Ruarc, prince of Breffny. O'Ruarc, aided by Roderick, King of Connaught, drove Dermot out of his territories, which the allies had invaded. Dermot applied to Henry for aid to regain his kingdom, and promised in the event of his being restored, to hold it in vassalage under the English crown. Henry gave Dermot permission to obtain soldiers from England, and thus strengthened his hold on Ireland, which he very soon conquered and retained.

4. In his wars Edward succeeded admirably. He conquered the Welsh, who, in their mountain-fastnesses, had long kept back the invading English. He showed great wisdom in his conduct of the war. He explored every road before him on his march, and secured every pass behind him, until he at last brought the Welsh to submission.

In his Scotch wars, he defeated the Scots at Dunbar (1296), Falkirk (1298), and captured the great leader Wallace, whom he executed; while his intervention in the dispute for the Scottish succession displayed consummate policy and tact.

His domestic policy was marked by vigour and justice. He passed the Statute of Mortmain (1279), and corrected, extended, amended, and established the laws. For this he is justly styled the English Justinian. He allowed the important constitutional change to be made that no tax should be levied without consent of parliament, and recognised the justice of accompanying grants of money with petitions for redress of grievances.

5. Edward III. adopted a high-handed policy with Scotland. There was considerable ill-feeling between the two countries at this time. Border warfare was very frequent, and serious encounters often took place. The son of Robert Bruce, the young David, held the Scottish throne. Edward III. asserting the rights of suzerain, with several English nobles, resolved to set up Edward the son of John Baliol, as a pretender to the Scottish throne. Their plan succeeded; David was sent over to France, and Edward Baliol reigned in his stead. But it was not for long; a revolution soon deprived him of his throne. Edward III. then sent an army into Scotland, and speedily subdued the southern counties. The Scots, however, persevered and kept Edward continually engaged in warfare. While

Edward was conducting the French war, the Scots under their king, David Bruce, invaded Northumberland, but were completely defeated at Neville's Cross, near Durham, by an English army under Edward's queen, Philippa (1346). Such relations existed between England and Scotland mainly because of Edward's ambition, which led him to interfere too much with the affairs of other countries. He was eager to submit other kingdoms to his own sway, and on the slightest pretext would send an army to enforce his authority.

6. The Saxons prided themselves on their skill in the use of the *bow and arrow*. For a great many years it was the principal weapon of warfare, and a deadly weapon it was. All through this period (1154—1399) the English increased in their skilful use of the bow and arrow. On the battle-field they would shoot their arrows high in the air, and let them fall on the heads of the enemy, like a thick cloud from which there was no escape. The *spear* was also used in hand-to-hand conflicts. In the French wars of Edward III. the English soldiers formed a breastwork of spears to receive the charges of the French cavalry. Knights were proud of the *battle-axe*, which they wielded with terrible effect. The Welshmen who aided the English carried a *long sharp knife* with which they wildly slashed their foes. In this period arose the use of the cross-bow, a strong iron-tipped arrow being ejected from the stock. These were very deadly instruments, but not so deadly as the *cannon* which was first used in the French campaign of Edward III.

The making of cannon, shot, and powder had the effect of increasing English industries. The iron industry would be greatly increased, and the manufacture of powder and shot would also employ a larger number of workmen. Thus *trade was strengthened* by these changes.

7. 'Lollards' was the name given to followers of John Wycliffe. This bold opponent of Roman Catholicism organised an order of poor preachers, 'the Simple Priests,' whose coarse sermons and long russet dress moved the laughter of the clergy. This new sect increased until in 1395, thirteen years from its formation, it seemed as if every third man in the streets was a Lollard. It had its own schools, books, and pamphlets. Scurrilous ballads, attacking the wealth and luxury of the clergy, were sung at every corner. It was supported by many men of position, amongst whom was Sir John Oldcastle, who opened his house for the reception of its missionaries. London was intensely Lollard in its hatred of the clergy. Richard II. sheltered the Lollards from persecution, and in the court itself Lollardism found favour. Thus this Puritanical movement prospered, supported by the common people, the barons, and the court. 'Lollard' is said to come from the German 'lullen,' to sing. Others say it simply means 'idle babbler,' and was a nickname of scorn.

The Lollards sought to reform the church by preaching against, and stubbornly opposing:—(1) The doctrine of transubstantiation; (2) indulgences; (3) absolutions; (4) pilgrimages to the shrines of the saints; (5) worship of the images and saints; (6) the debauchery of the priesthood; (7) the sacraments being changed into idolatrous feasts; and (8) the supremacy of the Pope.

8. Henry III. is an instance of a weak king giving himself up to favourites. Hubert de Burgh, Peter des Roches, both Poicteoins, enjoyed his favour at different periods, to the great annoyance and jealousy of the other courtiers. The chief positions of the court were given to foreign favourites, and this caused a sore grievance amongst the English nobles.

Edward II. is another instance. His fondness for Piers Gaveston was a source of serious trouble to him, and the consequences of his first exhibition of favouritism did not deter him from having other favourites afterwards. The Spensers, father and son, became his favourites later on, and they were so unpopular as to be taken and hanged by the indignant courtiers.

9. Edward the Black Prince, so called from the colour of his armour, was the eldest son of Edward III. He commenced his glorious career at the Battle of Crecy, 1346, at the early age of sixteen. He won his spurs in this battle, and followed up this success by the victory of Poictiers, 1356. So great a soldier was he, that his name was dreaded throughout France. His presence on the field of battle was almost an assurance of success. His bravery was exceedingly great; he scarcely knew what fear was. He could be generous and forgiving, but he could also be remorseless and cruel. The greatest blot on his character is the Sack of Limoges. The whole of the inhabitants he put to death, and the streets ran with blood. He also wasted a great deal of the produce of the country, destroying many gallons of wine, and laid waste the land through which his army passed. Having finished his campaign in France, he undertook to assist the cruel Don Pedro to regain the throne of Spain, from which his brother Henry had driven him. This was a most unfortunate campaign; the climate laid hold of the Black Prince, and a serious illness, from which he never recovered, prostrated him. He had defeated Henry of Spain at the Battle of Navaretta, and had placed Pedro once more on the throne. The purpose of his expedition was fulfilled, but at the cost of his life. He returned to England, where he died in 1376, in the prime of his life. His military talents and valour formed the subject for much admiration, and his generosity, affability, and moderation gained the affections of all men. The only points in his character to lament are the severity and cruelty with which he punished the people of Limoges. He left behind him a son, Richard of Bordeaux, who succeeded to the throne of his grandfather.

10. *Statute of Praemunire* (1392).—This statute forbade the purchasing at Rome or elsewhere of excommunications, bulls, or other instruments. Persons so offending should forfeit lands and goods to the king, and they themselves were to be attached by their bodies to answer to the king and his council for their offence. It also made null and void John's submission to the Pope, that submission being without the concurrence of Parliament.

Statute of Mortmain (1279).—This statute was passed in the reign of Edward I. to check the growing power of the church. By this act no lands could be granted to the church without the king's license.

Statutes of Labourers (1349, 1351).—The first statute enacted that all able-bodied men and women must work, and settled that labourers and craftsmen were to receive the average wages of the last few preceding years. The second act set forth a fixed scale of wages both for labourers and other workmen, and further limited the sphere of labour for these men to their own locality, with the exception of the men of Staffordshire, Derbyshire, Lancashire, Craven, and the border districts of Scotland and Wales.

Male Candidates.

SECOND YEAR.

History.

1. The alarm occasioned by the Manchester riots led to the opening of Parliament in November, 1819, when the ministers passed the following Six Acts, providing for:—

(1). More speedy execution of justice in cases of misdemeanour.

(2). The prevention of military training.

(3). The prevention and punishment of blasphemous and seditious libels.

(4). The seizure of arms.

(5). A stamp act with a view to repress libels.

(6). The prevention of seditious assemblies.

2. The chief members of Canning's Ministry of 1827 were Canning, Lords Palmerston, Lyndhurst, Dudley, Mr. Grant and Mr. Lamb.

The Duke of Wellington, Lord Eldon, and Mr. (afterwards Sir Robert) Peel, who had been members of Lord Liverpool's Ministry, refused to join Canning's.

3. (1). Repeal of Corporation and Test Acts, 1828.

These Acts, passed during the reign of Charles II., required that persons holding office under the Crown should take the Sacrament according to the usage of the Church of England and to declare their disbelief in the doctrine of transubstantiation. Irishmen, who were nearly all Catholics, were thereby kept out of office.

(2). Roman Catholic Relief Bill, 1829.

Until the passing of this bill no Catholic could sit in Parliament or hold any high office.

The bill admitted them to Parliament and to all offices except those of regent, Lord Chancellor of England and Ireland, and Viceroy of Ireland.

It raised the franchise in Ireland from 40s. to £10 and made certain regulations respecting the exercise of the Catholic religion.

4. It was a main principle of the 1st Reform Bill that boroughs having a population of less than 2000 should cease to return members, and that those having a population of less than 4000 should not return more than one member. 56 boroughs were therefore disfranchised, and 31 others lost one member.

Between 40 and 50 new boroughs were created, including four metropolitan, and large towns such as Birmingham, Manchester and Leeds, which had lately grown into importance, received additional members.

The larger counties were divided into districts, thus forming 82 constituencies instead of 52. The counties received an increase of 65 members.

Both county and borough franchises were extended.

In counties the 40s. freeholders were retained, and votes were given to (1) copyholders of £10 per annum; (2) leaseholders of the annual value of £10 for 60 years or £50 for 20 years; (3) Occupiers paying an annual rental of £50.

In boroughs the franchise was given to all £10 resident householders.

Provisions were also made for shortening and regulating elections, and for the registration of voters.

5. The six points of the Charter were :—

(1). Universal Suffrage.

(2). Annual Parliaments.

(3). Vote by ballot.

(4). Abolition of property qualification for members of Parliament.

(5). Payment of members.

(6). Equal electoral districts.

Universal suffrage was practically given by the Reform Bill of 1884.

A ballot act was carried in 1872.

The property qualification was abolished by law in 1858.

It had become of no effect some years before that time.

By the late Reform Bill electoral districts have been made as nearly equal as possible in population.

6. About the year 1833 the Reformed Parliament voted a sum of £2000 to be annually expended in the promotion of education by the National and the British and Foreign School Societies.

The Committee of the Council on Education is appointed by the Crown at the time of the formation of a Ministry. It consists of the Lord-President and Vice-President of the Council and such others of the government as Her Majesty may please to direct.

The Committee of 1885 consisted of the Lord President and Vice-President, with the Lord Privy Seal; the Secretary for Scotland; the Secretaries of State for Home and War Departments; Chancellor of the Exchequer; First Lord of the Admiralty; and the President of the Local Government Board.

7. (1). *War in Afghanistan.*

Dost Mahomed, the ruler of Afghanistan, was suspected of favouring Russian designs upon Herat. Lord Auckland, Viceroy of India, determined to drive him from his throne. He was conquered by an English army under Sir John Keane (1839) and Shah Soojah, a descendant of the old rulers of Afghanistan, was placed upon the throne. The bulk of the British forces was then withdrawn, leaving only a small body to support the Government. In 1841 an insurrection broke out in Cabul. Capt. Burnes, the British envoy was murdered, and the troops were compelled to evacuate the country. During their retreat they had to endure the most terrible sufferings from the severity of the weather and attacks of the Afghans. They were compelled to surrender their commanders and the women into the hands of Akbar Khan, son of Dost Mahomed. Only one man of the army survived.

Lord Ellenborough, the new Viceroy, took measures to avenge this disaster. General Pollock led an army into the country, relieved General Sale, who had been holding out at Jellalabad, and then marched to Cabul, which was taken *Sept. 1842.* After recovering the prisoners and burning the Grand Bazaar as a punishment the English withdrew.

(2). *War with China.*

This was caused by disputes concerning the opium trade. That trade was carried on by English merchants, notwithstanding the fact that it was forbidden by the Chinese Government. When the Chinese authorities insisted on the forfeiture of large quantities of opium in the hands of British traders, Captain Elliott, the chief superintendent of our trade sent to India for ships of war. The conflict soon began. The English gained several victories and in *1842* the Chinese made peace on any terms. Hong Kong was surrendered; five ports thrown open; and a large indemnity paid.

8. In the year 1842 Sir Robert Peel imposed for the first time the income tax, to improve the revenues of the country, which were then in a bad state. The surplus thus produced was used in reducing the taxes on commodities. In a few years the number of taxed articles was reduced from twelve hundred to twelve.

The chief change in the year 1844-45 was the alteration in the sugar duties. Sugar from our West Indian Colonies was admitted into this country at a much lower rate than that from other foreign countries, because it was said labour had been made dear by the abolition of slavery in our colonies. Peel now passed a measure equalising the duties by a process extending over five years.

9. The movement in favour of the Repeal of the Corn Laws began at Manchester in 1836. The manufacturers of that place thought that in keeping up the price of corn their interests were made to suffer in order that agriculturists might be benefited.

In 1839 the Corn Law League was formed with the object of bringing about the repeal of the Laws. Its nominal leader was Charles Villiers, but its real leaders were Richard Cobden and John Bright. Large sums of money, collected by the League, were spent in propagating their principles.

An unexpected event soon came to their assistance. In 1845 a disease totally destroyed the potato crop in England and Ireland, thus depriving the peasants of the latter country of the chief means of subsistence, and bringing them to the verge of starvation. The Free Traders demanded the opening of the ports to foreign corn. The Prime Minister, Sir Robert Peel, was in favour of this course but was not supported by his Cabinet. Lord Stanley resigned and the Ministry broke up.

Lord John Russell could not form a Cabinet so Peel was recalled. Parliament met in January 1846. The Prime Minister gave an explanation of his conversion to Free Trade principles, stating his belief that the reduction of the duty always led to an expansion of the revenue. He was violently attacked by Mr. Disraeli.

A bill was passed on May 15th, 1846, which lessened the duties and arranged for their total abolition at the end of three years. Through the influence of the Duke of Wellington it passed the House of Lords.

10. Each of the Australian Colonies, with the exception of Western Australia, is ruled by a Governor appointed by the Crown, Executive and Legislative Councils and a House of Assembly.

The Executive Council consists of the chief officers of state. They provide for the execution of the law, and hold office only so long as they retain the confidence of Parliament. It is similar to our Cabinet Council, but has less power.

The Legislative Council or Upper House corresponds to our House of Lords. In New South Wales the members are nominated for five years. In South Australia the members are chosen by the whole colony voting as one district, and the House cannot be dissolved, but one-third of the members retire every four years.

The House of Assembly is elected by universal suffrage.

These Parliaments are quite independent of the Imperial Parliament. They may impose protective or other duties; or may pass laws violating our treaty engagements.

The chief point of connection with the mother country is the right of veto possessed by the Crown, to any bill.

11. A large proportion of the inhabitants of Turkey were of the Sclavonian race and professed the religion of the Greek Church of which Russia is the head. The manner in which Turkey ruled these subjects was a constant bone of contention between the two countries. It was strongly suspected by the powers that instead of wishing to protect Christians the Russians were actuated by a desire to obtain possession of Constantinople and the Bosphorus.

The Czar Nicholas tried unsuccessfully to arrange with English statesmen a partition of the Turkish Empire between the two countries.

A dispute arose between the Greek and Latin Churches concerning some holy places in Palestine. France espoused the cause of the latter. This dispute was settled, but Russia still demanded the right of protecting the Greek Christians in Turkey. When this was refused the Czar marched an army across the Pruth.

In November, 1853, the Turkish Fleet was destroyed at Sinope. France and England told Russia that their squadrons would enter the Black Sea to repel by force any further attack on Turkey.

Russian ambassadors were then withdrawn from Paris and London and war was declared.

By the treaty of Paris it was agreed that the Black Sea be neutralized. It was thrown open to merchants of every nation; but neither power was to keep armed vessels in the sea, save a few small boats to act as maritime police.

12. In the year 1861 a war broke out between the Northern and Southern States of America. England secretly favoured the cause of the South. This, and a dispute caused by the seizure by the North of two Southern envoys on board an English ship, caused a very bitter feeling in this country against the North.

The Confederates purchased a number of privateers to war on Northern merchant vessels. Several of these were built in England notwithstanding the protests of the American Minister.

The most famous privateer was the Alabama built on the Mersey. Though warned that the vessel was about to leave the Mersey the English Government did not prevent its departure. During her career the Alabama captured seventy vessels, decoying her victims by hoisting the British flag.

After the close of the war the United States Government claimed compensation from England for the damage done to her commerce.

A Commission held at Washington provided for the settlement of the claims by a tribunal of five arbitrators, one appointed by the Queen, the others respectively by the President of the United States, the King of Italy, the President of the Swiss Confederation and the Emperor of Brazil. This tribunal was to meet at Geneva and to decide by a majority all claims submitted to it. The decision was against England who had to pay 3¼ millions sterling in settlement of the claims.

13. The Education Act of 1870 gave power to the inhabitants of a district in which there was an insufficient number of schools, or in which the existing schools were inefficient, to have a School Board for the provision of a proper education. These boards were to be elected by the ratepayers, and supported partly by local rates, partly by Government Grants, and partly by school fees. They had power to frame bye-laws compelling the attendance of all children from five to twelve years of age, within the school district. Free schools were to be provided in places where the poverty of the people made it necessary.

Existing denominational schools were to receive Government grants on condition that they were efficient, that they submitted to an examination by Her Majesty's Inspector, and accepted a conscience clause. This clause allowed parents to withdraw their children from the religious instruction given in the schools if it was not in agreement with their opinions.

14. Compare in size and population our possessions in 1815 and 1870. We must see how that growth has taken place.

(*a*) *Asia.* Mention wars in which England has been engaged since 1815, and what territories were ceded after them.

(1) Burmese War, 1826. Assam, Aracan, Tenasserim.

(2) Chinese War, 1842. Hong Kong.

(3) Indian Wars, 1843-56. Scinde, Punjaub, Nagpore, Oude.

We also gained Singapore, Aden, Perim.

(*b*) *Africa.*

Natal annexed, 1843.

Gold Coast Settlements at different times.

(*c*) *America.* Hudson's Bay Company. Formation and Territories it possessed. End of Company and annexation of its Territories (1869).

(*d*) *Australia.* Discovery of gold. People rushed out to West Australia (1829), South Australia (1836), Victoria (1851). Queensland formed (1859); New Zealand (1839).

Model Answers to Latin, French, Greek, Domestic and Political Economy, School Management, Music, and Algebra, will appear in our next issue.

Query Column.

RULES.

1. Each correspondent is restricted to *one question.* We should be much obliged if correspondents, who send questions for solution, would give (if possible) the required answer, and the source from which the question is obtained.

2. No query can be answered unless accompanied by the real name and address of the sender, not necessarily for publication, but as a guarantee of good faith and for facility of reference.

3. ☞ **When a pseudonym is adopted it should be written at the end of the query, and the real name and address on a separate piece of paper.**

4. Correspondents are requested to write their queries *legibly*, and on one side of the paper only.

5. Replies will not be sent through the post.

6. Queries must reach the office *not later than the 12th of the month*, or they cannot be attended to in the following issue.

*** All communications for this column should be addressed—'*The Query Editor*,' *The Practical Teacher*, *Pilgrim Street, Ludgate Hill, London, E.C.*

Arithmetic.

1. ALEXANDER.—I sold out of the 3 per cents. at 96, and invested the sum accruing in railway 5 per cent. stock, thereby increasing my income 50 per cent. What was the price of the Railway Stock? (*Moffatt's* 'Pupil Teachers' Course.')

Income on £96 in Railway Stock

$= £3 + \frac{1}{2}$ of £3

$= £4\frac{1}{2}$;

$\therefore$ Price of Railway Stock $= £96 \times \frac{5}{4\frac{1}{2}}$

$= £96 \times \frac{10}{9}$

$= £106\frac{2}{3}$. Ans.

2. L. GRAHAM.—A starts from London to walk to Brighton (50 miles) at 4 miles an hour, and B starts from Brighton at 3 miles an hour, but 2 hours earlier. Where do they meet, and how far will B be from London when A arrives at Brighton?

(*Capel's* 'Catch Questions.')

Time when they meet (from A's time)

$= \frac{50 \text{ miles} - (3 \times 2) \text{ miles}}{(4 + 3) \text{ miles}}$ hours

$= \frac{44}{7}$ hours

$= 6\frac{2}{7}$ hours;

$\therefore$ They meet $(4 \times 6\frac{2}{7})$ miles from London

$= 25\frac{1}{7}$ miles from London. Ans.

Distance of B from London when A arrives at Brighton
$= 50 \text{ miles} - [3 \text{ miles} \times (\frac{30}{4} + 2)]$
$= 50 \text{ miles} - (3 \text{ miles} \times 14\frac{1}{2})$
$= (50 - 43\frac{1}{2})$ miles
$= 6\frac{1}{2}$ miles. Ans.

Note.—Todhunter's 'Algebra for Beginners,' and *Dunstan's* 'Teacher's Manual of Music.'

3. FOLKESTONIAN.—A owes a debt to be paid in four equal instalments at the end of 4, 9, 12, and 20 months respectively, but finds that 5 per cent. per annum being allowed as discount, £750 paid at present will discharge the whole debt. What does he owe?

Suppose the debt were £400;
Then (reckoning banker's discount), present payment
$= £400 - [(\frac{1}{4} + \frac{3}{4} + 1 + \frac{1}{2}) \text{ of } £5]$
$= £400 - 3\frac{1}{2} \text{ of } £5$
$= £400 - £18\frac{3}{4}$
$= £381\frac{1}{4}$;
$\therefore £381\frac{1}{4} : £750 :: £400 : \text{Amount of debt.}$

$$\begin{array}{r|l} 4 & 4 \\ \hline 1525 & 3000 \\ 61 & 120 \\ & \hline & 400 \\ & 61)\overline{48000} \\ & £786\ 17\text{s.}\ 8\frac{3}{61}\text{d.} \end{array}$$ Ans.

4. DERRY ORMOND.—A man travels from England to India in $24\frac{1}{2}$ days, partly by land, and partly by water; his rate of travelling is 30 miles per hour by land, and 12 by water. If he could have travelled all the way by land, he would have finished the journey in $16\frac{1}{4}$ days. Compare the distances travelled by land and by water. (*1st Year Certificate*, 1878.)

$$\text{No. of days by land} = \frac{16\frac{1}{4} \times 30 - 24\frac{1}{2} \times 12}{30 - 12}$$
$$= \frac{487\frac{1}{2} - 294}{18}$$
$$= \frac{193\frac{1}{2}}{18}$$
$$= 10\tfrac{3}{4};$$
,, ,, water $= 24\frac{1}{2} - 10\frac{3}{4}$
$= 13\frac{3}{4}$;
$\therefore$ Distance by land : Distance by water
$:: 30 \times 10\frac{3}{4} : 12 \times 13\frac{3}{4}$,
$:: 5 \times 43 : 2 \times 55$,
$:: 43 : 22$. Ans.

Algebra.

1. THEBES.—Solve:—

(*a*) $a^{\frac{1}{2}} + x^{\frac{1}{2}} = a^{\frac{1}{2}}x^{\frac{1}{2}}$;

(*b*) $(a + x)^{\frac{1}{2}} + (a - x)^{\frac{1}{2}} = b$. (*Bonnycastle.*)

(*a*) $a^{\frac{1}{2}} + x^{\frac{1}{2}} = a^{\frac{1}{2}}x^{\frac{1}{2}}$
$a^{\frac{1}{2}}x^{\frac{1}{2}} - x^{\frac{1}{2}} = a^{\frac{1}{2}}$
$(a^{\frac{1}{2}} - 1)\,x^{\frac{1}{2}} = a^{\frac{1}{2}}$
$$x^{\frac{1}{2}} = \frac{a^{\frac{1}{2}}}{a^{\frac{1}{2}} - 1}$$
$$\therefore x = \frac{a}{(a^{\frac{1}{2}} - 1)^2}.$$

(*b*) $(a + x)^{\frac{1}{2}} + (a - x)^{\frac{1}{2}} = b$

Squaring each side $\Big\}\ a + x + 2\sqrt{(a + x)(a - x)} + a - x = b^2$
$2\sqrt{a^2 - x^2} = b^2 - 2a$
$4(a^2 - x^2) = (b^2 - 2a)^2$
$4a^2 - 4x^2 = b^4 - 4ab^2 + 4a^2$
$4x^2 = 4ab^2 - b^4$
$= b^2(4a - b^2)$
$$x^2 = \frac{b^2}{4}(4a - b^2)$$
$$\therefore x = \pm\frac{b}{2}(4a - b^2)^{\frac{1}{2}}.$$

2. MOLESTUM. — There are x boats in a race. Five are bumped; how many row over the course? (*Hamblin Smith.*)

No. $= x - (5 \times 2)$
$= x - 10$. Ans.

3. THE GREEN. — If $2y = x - \frac{1}{x}$, $2z = x + \frac{1}{x}$, find the value of

$$\frac{2x\sqrt{1 + y^2}}{y + \sqrt{1 + y^2}} \times \frac{4x\sqrt{z^2 - 1}}{z + \sqrt{z^2 - 1}}.$$

(*London College of Preceptors*, 1884.)

$$\frac{2x\sqrt{1 + y^2}}{y + \sqrt{1 + y^2}} \times \frac{4x\sqrt{z^2 - 1}}{z + \sqrt{z^2 - 1}}.$$

$$\left\{\begin{array}{l|l} 2y = x - \frac{1}{x} & 2z = x + \frac{1}{x} \\ y = \frac{1}{2}\left(x - \frac{1}{x}\right) & z = \frac{1}{2}\left(x + \frac{1}{x}\right) \\ y^2 = \frac{1}{4}\left(x^2 - 2 + \frac{1}{x^2}\right) & z^2 = \frac{1}{4}\left(x^2 + 2 + \frac{1}{x^2}\right) \\ 1 + y^2 = \frac{1}{4}\left(x^2 + 2 + \frac{1}{x^2}\right) & z^2 - 1 = \frac{1}{4}\left(x^2 - 2 + \frac{1}{x^2}\right) \\ \sqrt{1 + y^2} = \frac{1}{2}\left(x + \frac{1}{x}\right) & \sqrt{z^2 - 1} = \frac{1}{2}\left(x - \frac{1}{x}\right) \end{array}\right.$$

$$= \frac{2x \times \frac{1}{2}\left(x + \frac{1}{x}\right)}{\frac{1}{2}\left(x - \frac{1}{x}\right) + \frac{1}{2}\left(x + \frac{1}{x}\right)} \times \frac{4x \times \frac{1}{2}\left(x - \frac{1}{x}\right)}{\frac{1}{2}\left(x + \frac{1}{x}\right) + \frac{1}{2}\left(x - \frac{1}{x}\right)}$$
$$= \frac{x\left(x + \frac{1}{x}\right) \times 2x\left(x - \frac{1}{x}\right)}{\left\{\frac{1}{2}\left(x + \frac{1}{x}\right) + \frac{1}{2}\left(x - \frac{1}{x}\right)\right\}^2}$$
$$= \frac{2x^2\left(x^2 - \frac{1}{x^2}\right)}{x^2}$$
$$= 2\left(x^2 - \frac{1}{x^2}\right)$$ Ans.

4. X.Y.Z.—If $x = cy + bz$, $y = az + cx$, $z = bx + ay$, show that

$$\frac{x^2}{1 - a^2} = \frac{y^2}{1 - b^2} = \frac{z^2}{1 - c^2}.$$

(*Hamblin Smith's Exercises.*)

$x = cy + bz$
$= cy + b(bx + ay)$
$= cy + b^2x + aby$
$x - b^2x = cy + aby$
$\therefore x(1 - b^2) = y(c + ab)$. (1.)

Again, $y = az + cx$
$= a(bx + ay) + cx$
$= abx + a^2y + cx$
$y - a^2y = cx + abx$
$\therefore y(1 - a^2) = x(c + ab)$ (2.)

Multiplying (1) and (2) crosswise,
$x^2(1 - b^2) = y^2(1 - a^2)$
$$\therefore \frac{x^2}{1 - a^2} = \frac{y^2}{1 - b^2}.$$
$x = cy + bz$
$= c(az + cx) + bz$
$= acz + c^2x + bz$
$x - c^2x = bz + acz$
$\therefore x(1 - c^2) = z(b + ac)$. (3.)

Again, $z = bx + ay$
$= bx + a(az + cx)$
$= bx + a^2z + acx$
$z - a^2z = bx + acx$
$\therefore z(1 - a^2) = x(b + ac)$. (4.)

Multiplying (3.) and (4.) crosswise,
$x^2(1 - c^2) = z^2(1 - a^2)$
$$\therefore \frac{x^2}{1 - a^2} = \frac{z^2}{1 - c^2}.$$

Wherefore,
$$\frac{x^2}{1 - a^2} = \frac{y^2}{1 - b^2} = \frac{z^2}{1 - c^2}.$$

Notes of a Lesson on Movements of the Air.

BY JOS. H. COWHAM, F.G.S.,

Lecturer on School Method: Westminster Training College.

PART II.—AIR PRESSURE.

EXPERIMENTS AND TRUTHS THEY TEACH.

1. To show that Air has weight and exerts pressure.

A. Downward Pressure:—Experiment 1. If a glass receiver, open at both ends, be placed on the stand of an air-pump, and the upper end be tightly covered with tissue paper previously painted with gum, a few strokes of the air-pump will lessen the amount of air, and hence its pressure on the under side of the paper. In consequence of the lessened pressure within whilst that on the outside is maintained, there is at first a slight tendency to force downwards the paper covering. If, however, more strokes of the air-pump be now taken, the extra pressure **without,** over that **within,** will cause the paper covering to burst inwards with a loud report.

Experiment 2.—Take a wide necked bottle and a hard-boiled egg. The egg fits nicely into the neck of the bottle (Fig. B). Now introduce into the bottle a bit of burning paper. When the paper is almost consumed replace the egg on the neck of the bottle. The egg is seen gradually to enter the neck of the bottle, and then all at once enters the bottle with a loud report.

Inference.—The egg is forced into the bottle on account of the WEIGHT OF THE AIR.

2. To show that air presses upwards as well as downwards.

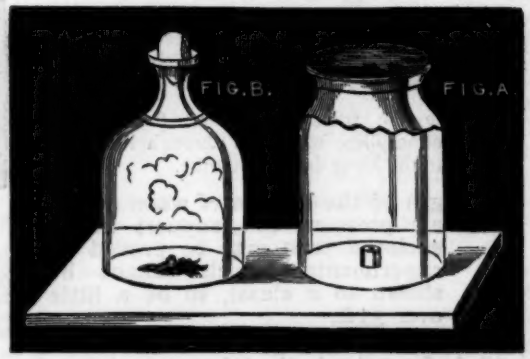
Experiment 3. Upward Pressure of Air:—Take a wine glass filled with water. Place evenly upon the top a sheet of note paper. Invert the glass and carefully remove the hand. The sheet of paper will remain attached to the glass, and the water will remain within the glass.

Reasoning.—The water in the inverted glass must exert a certain pressure upon the side of the paper within the glass.

As there is nothing but air on the other side of the paper, therefore

The pressure of the air in an upward direction must be equal to or greater than the weight of the water within the glass.

TEACHING HINTS, DIAGRAMS, &c.



B. Showing the egg placed on the neck of the bottle.

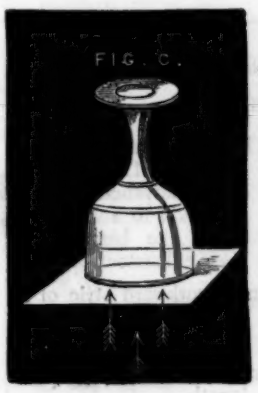
A. Showing pressure outside bursting the paper covering.

Experiment 1.—Draw attention to the state of the paper covering before the air pump is touched. When the depression of the paper occurs, ask children to account for the movement.

If necessary explain by analogy as follows:

Two groups of boys are equally matched; they form two lines and thus push against one another. So long as both are exactly equal in strength there is no movement. Take away a member from one side and at once the weakened side begins to withdraw.

Experiment 2.—**Review of the Facts.** (1) From previous lessons the class will know that the lighted paper would cause the air within to be dilated. (2) Some of the air would then be forced out of the bottle. (3) Upon cooling the air within would contract and thus less pressure would be felt on the under end of the egg than on its upper side: Now draw the inference.



C. Illustrating the upward pressure of the atmosphere exerted on the under side of the paper.

Make it clear, if necessary by reference to scales in a shop, that so long as the water remains in the vessels the pressure outside must be equal to or greater than the weight of the water. If children understand a spring balance reference to it should be made.

Measurement of Air Pressure:—

Experiment 4. If a long tube closed at the top by a tightly fitting cork, but open at the bottom, be filled with water and inverted with the open end under water, the water remains in the glass tube.

Reasoning:—The pressure upwards at the lower open end of the tube must be in this case equal to or greater than the weight of the water above.

This pressure cannot be that of the water only, because the column of water in the glass is not sufficiently high to balance the column in the tube.

Hence the pressure must be that of the atmosphere continued through the water to the lower end of the tube.

Length of the column of water which air pressure can support in an enclosed tube may be proved by experiments (which cannot be shown to a class), to be a little over 33 ft.

Substitute for water in the tube:—

Mercury is a little more than 13½ times heavier than water. If, then, the water column supported by the atmosphere be 33·8 ft., the mercury column, by calculation, should not be far from 30 inches.

If the mercury in a tube of a square inch stand at about 30 inches, the mercury, when weighed, will be about 15 lbs.

This, then, is the pressure of the atmosphere on every square inch.

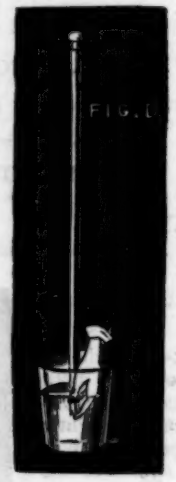


Fig. D. Showing water kept in a long tube through air pressure:—

The truth of our conclusion can be proved if we remove the cork at the top of the tube. The water at once falls to the level of that of the glass.

At South Kensington Museum there is a glycerine barometer, and at the Crystal Palace there used to be a water barometer: In consequence of the difficulty in constructing and in fixing these long tubes the necessity for a heavier liquid will be shown.

In fig. E we have the means of exactly measuring the weight of the atmosphere on a given area, say a square inch:—

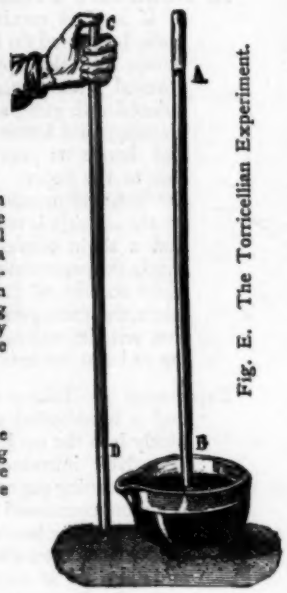


Fig. E. The Torricellian Experiment.

Lectures on Shakspere's 'King Lear.'

BY H. MARMADUKE HEWITT, M.A., LL.M.,

Late Assistant-Examiner in the University of London.

No. IX.—From Act IV., Scene 6, line 81, to the end of the Play.

Line	85, 6, *There's your press-money*	There's earnest of your service. [This was the money advanced (*prestē* or *prêté*) to soldiers to clinch the bargain on their enlistment.]
„	86, *handles his bow like a crow-keeper*	In the awkward style of a rustic who frightens crows off the corn.
„	87, *a clothier's yard*	an arrow of cloth-yard length.
Line	89, *the brown bills*	the men with brown halberds. The weapon was browned to keep it from rusting.
„	90, *O well flown, bird!*	A capital shot! [There is no bird. Lear imagines that he is looking on at a shooting-match.]
	ib. i' the clout, i' the clout	On the bull's-eye. [The clout was the mark or pin in the centre of a target.]
Line	96, *white hairs, &c.*	They told me that I had the wisdom of age before I attained to manhood.
„	104, *the trick of that voice*	the peculiarity (or characteristic) of that voice.
„	119, *I would not take this from report, it is*	I would not credit any report of such inhumanity as my father has suffered; it is, however, a reality.

Line 122, *What, with the case of eyes?*	What! must I read with the empty sockets?
„ 123, *Are you there with me?*	is that what you mean?
„ 143, *I' able 'em*	I will defend them (or, vindicate them).
„ 149, *O, matter and impertinency mixed!*	What a strange mixture of sense and nonsense!
„ 157, *We cry that we are come*	we weep because we have made our entry.
„ 158, *This is a good block*	this is a well-shaped hat. [The old King was fumbling with his hat in his hand. He had taken it off when he said 'I will preach to thee.']
„ 170, *make a man a man of salt*	cause a man to weep copiously
„ 185, *Do you hear aught, Sir, of a battle toward?*	do you hear anything of a battle that is being fought? (or, that will shortly take place?)
„ 186, *most sure and vulgar*	most certain and generally known.
„ 188, 9, *the main descry stands on the hourly thought*	the sight of the main body is expected hourly, *i.e.*, we are expecting every hour to get a sight of the main body.
„ 198, *Who, by the art of known and feeling sorrows*	Who, by reason of well-known and touching sorrows.
„ 199, *Am pregnant to good pity*	Am inclined to much pity.
„ 208, *A published traitor*	a traitor against whom a proclamation has been made.
„ 214, *An chud ha bin zwaggered out of my life*	If I could have been killed by mere bluster. [*An* for *if*.]
„ 217, *Your costard or my ballow*	Your head or my cudgel. [The word *costard* means an apple. Vulgar people still call a man's head his 'nut.']
„ 235, *Leave, gentle wax; and, manners, blame us not*	Open, good sealing-wax, and may I be pardoned for this breach of good manners [opening another man's letter].
„ 246, *O undistinguished space of woman's will!*	O boundless license of a woman's desire!
„ 249, 50, *Thee I'll rake up, the post unsanctified of murder*	thee I'll cover up; unholy missive of two incestuous murderers.
„ „ *the death practised Duke*	the duke whose death is plotted.

The student will have had some trouble perhaps in wading through this 'matter and impertinency mixed,' and in following the rapid transition of the mad monarch's ideas. But some of his utterances are worth remembering. Such are—

'A dog's obeyed in office,'

and

'Through tattered clothes small vices do appear,
Robes and furr'd gowns hide all. Plate sin with gold,
And the strong lance of justice hurtless breaks.'

There is evidently an allusion to the story of Canute in the passage *'When the rain came to wet me,'* &c. (91). In *peace* at my bidding (101) we have an instance of the ease with which Shakspere coins verbs from other parts of speech. From the passage *a smug bridegroom* (174), we see that the meaning of *smug* had not then deteriorated. Indeed, if we recollect aright, this play has furnished us with but few illustrations of what grammarians term the Degradation of Words. The introduction of a few touches of the Somersetshire dialect, as it existed in Shakspere's time, is not without interest. Of course the reader has noticed *chud* for 'I should' (214), and *chill* for 'I will' (220).

Scene 7.

Be better suited	Put on better clothes.
To be known shortens my made intent	to be recognised interferes with the intention I had formed.
this child-changed father	This father who has been driven mad by his children [*child-changed* is a compound like *ink-stained*, *pock-marked*, &c., which are epithets in which the former word stands for the agent].
Proceed in the sway of your own will	Act as your own inclination sways you
I doubt not of his temperance	I have no doubt of his calmness [*i.e.*, of his becoming or remaining *calm*].
Restoration hang thy medicine on my list	[Here, though, there is probably a personification of restoration, the passage is equivalent to the expression of a wish that the speaker may be able by her (kind) words to bring the king back to consciousness.]
thy reverence	thy revered person.
Line 33, *poor perdu!*	poor lost one!
„ 34, *this thin helm*	this covering of thin white hair.
„ 50, *still, still far wide*	still far from sound in intellect [literally, far wide of the mark].
„ 80, *even o'er*	reckon up, or go over again in thought.

Line 94,	*powers of the kingdom*	forces of the realm.
„ 95,	*arbitrement*	settlement, decision.
„ 97,	*My point and period*	my end and consummation. [Kent means that the present time will be the culminating point of his fortunes, whether for good or evil.]

These weeds (7) for 'these clothes,' help us to understand the well-known phrase 'widow's weeds.' The origin of this 'weed' is the A.-S. *wæd*, clothing. In the same line, *memories* stands for 'memorials.' Lear's mention of a 'wheel of fire' seems to suggest that he held the idea of Purgatory, but is not conclusive on this point, though Shakspere, certainly, would never have shrunk from the anachronism. The broken utterances of the poor old man as he 'comes to' are thought to be extremely natural. Of course anyone can see the logical inaccuracy of such an expression as—

'Fourscore and upward; not an hour more or less.'

Act V.

We have now reached the Fifth and last Act of this Tragedy. Everything has now to be settled; the persons and personages who have to die have to be killed off; the great battle to be 'lost and won,' and all the rest to be arranged as the poet, in his good will and pleasure, has previously determined. We will assume that our readers are familiar with the plot. Not many students, we hope, could have gone on from time to time, taking up the play as a lesson, without feeling an uncontrollable impulse to look and see how it all ended. Many will have been disappointed, and, perhaps, a little saddened, to find that in 'King Lear' *everything* ends unhappily. There is not a single bright spot to relieve the darkness of the *denouement*. Many people are of opinion that Kent must be added to the list of victims. This, however, is not quite certain, since we are at liberty to regard his enigmatical language as that of a despairing rather than a dying man.

But that which has at all times shocked the sensibilities, whether of the reader or the audience, is the fate of Cordelia. That this brave, gentle, noble-hearted girl should perish, has always appeared, to a certain class of minds, to be too shocking, and the public were long accustomed to, and showed their preference for, a version in which Cordelia remains prosperous and happy. The rules of art, however, and of dramatic composition, are said to be, unfortunately, on the side of Shakspere, and we might point out, even without appealing to these august conceptions, there are many serious inconsistencies and inaccuracies in which such an alteration would involve us. What can Lear do but die? After all his dreadful sufferings; after denouncing his daughters and hearing of their destruction, and lastly, after having long talked and acted like a man incurably insane, how could he be imagined to be saved at last and pass the remainder of his days in peace and prosperity? For the sake of his own dignity Lear can do nothing else but die, and if Lear dies Cordelia must die with him. There is no other way out of the complication.

We trust our readers will pardon us this unadorned and possibly irreverent statement of the situation, but such is really, after all, the sum and substance of what the critics allege at greater length and with greater solemnity. In Dr. Johnson's time it appears, and for several years afterwards, it was the custom in the London theatres to use a version in which Cordelia remains victorious and happy, and thus the feelings of the audience were spared, though the critics were dissatisfied. The frequenters of the gallery, it is said, were mainly in favour of this arrangement, while the opinion of Addison was quoted in defence of Shakspere and the now accepted text. This state of things gave occasion for the introduction of a Latin quotation, and never perhaps was a line from the classics more wittily introduced. Most scholars will recollect the line from Lucan:—

'*Victrix causa Deis placent sed victa Catone.*'

Its applicability will be manifest if we translate it, 'The winning side was taken by the gods (of the gallery), but the losing side by (the author of) Cato.' Addison, our readers will remember, wrote a tragedy called 'Cato,' which contains a passage of unique grandeur on the Immortality of the Soul.

And yet this wish to see the good triumphant is very natural and proper. This is how we would have it, if we could. If we cannot see it thus in the world we live in we like at all events to see it in the creations of our fancy. Hence the great majority of both plays and stories end happily. There must, however, be nothing in the earlier scenes to render such an ending very unnatural or improbable.

Thackeray, if we remember rightly, received many letters from persons imploring him 'not to kill Colonel Newcome,' at the time when the course of his tale (which came out in numbers) seemed to foreshadow penury and death for the amiable veteran. People wished that he might live to grow rich again, and even imagined that the author could make him so with a few strokes of the pen. The author, however, was obliged to refuse this, knowing that such a termination would mar the artistic value of the work.

In other words, Colonel Newcome, as he previously had drawn him, was not the man to be likely to come to a prosperous end.

There is a rather difficult passage in the First Scene (lines 20—27), on which a few remarks may be offered. Who are the persons *whom the rigour of our state forced to cry out?* These words may be paraphrased 'who have been compelled to complain of the rigour of our government.' Sympathisers with Lear, perhaps, are intended. The drift of the remainder of the speech is as follows: 'We must distinguish between the circumstances of our position. I never could be valiant, except in an honourable cause. With regard to the invasion of our land by France, I am bound to repel it. I am not concerned, however, with the fact that this invasion emboldens the (former) king, and others who I fear have very good reasons for their resistance of authority.' We must understand *as he* before *holds the king* (26), and Lear is undoubtedly the person meant by '*the king*.' These few lines are certainly a very tough bit of English, and passages of

this character go far to support the idea which schoolboys now and then are found to entertain, that Shakspere, in writing his Plays, produced intentionally a supply of 'nuts to crack' for future students of English grammar.

The ancient of war (32) is certainly a curious expression for 'the experienced warriors.' Very possibly the text is corrupt, especially as the line is metrically defective. In '*the guess of their true strength and forces by diligent discovery*' (52, 3), the words *guess* and *discovery* stand, undoubtedly, for 'estimate' and 'observation.' In *carry out my side* (61), the allusion is, perhaps, to a game at cards, for the speaker uses the word *side* where we should expect him to use *intention* or *purpose*. *His taking off* (65) is a modified expression for *his murder*, as in Macbeth I., 7, 20:—

'The deep damnation of his taking off.'

Scene 2.

He and his daughter ta'en	He and his daughter (are) taken prisoners. [The hurried nature of the communication will account for the omission of the verb.]
Ripeness is all	To be prepared is everything.

Scene 3.

Line 2, 3, *Their greater pleasures . . . that are to censure them*	The will and pleasure of the more exalted personages who will have to pass judgment upon them.
„ 17, *God's spies*	Angels commissioned by God to survey and report upon the doings of men.
„ 18, *packs and sects*	Perhaps 'combinations and sets'?
„ 33, 4, *thy great employment will not bear question*	The important business which is now entrusted to you will not bear debating on.
„ 43, *the opposites of this day's strife*	Our opponents in to-day's contest.
„ 50, *pluck the common bosom on his side*	Bring over the hearts of the people to his side.
„ 51, *turn our impressed lances*	Turn the lancemen whom we have engaged.
„ 51, 2, *in our eyes which do command them*	against the faces of us (*i.e.*, against us) who command them.
„ „ *the which immediacy*	Paraphrase by—he therefore holding authority directly. [Again the abstract for the concrete.]
Line 70, *he compeers the best*	he is the equal of the best. [Lat. *vel maximos æquat.*]
„ 80, *the let alone lies not in your good-will*	Whether he shall or not does not depend on your choice.
„ 84, *in thine attaint*	in making attainder of thee. [Notice, that there is another reading *in thine arrest.*]
„ 144, *some say of breeding*	some spice of good-breeding. [The word *say* is a contraction of *assay.*]
„ 184, *The bloody proclamation to escape*	Paraphrase this [by 'The wish to escape this bloody proclamation.' [The reader will observe that a subject for '*taught me*' (187), must be got from this line.]
„ 214, *Threw him on my father*	threw himself upon my father (*i.e.*, embraced him affectionately).
„ 264, *Is this the promised end?*	Is this the predicted end of the world?
„ 265, *or image of that horror?*	or something resembling that dreadful day?
have foredone themselves	have destroyed themselves. [Notice that there is another reading, viz., *fore-doomed, i.e.*, anticipated their own doom.
desperately are dead	have died in despair.
this great decay	this great man in his dotage [spken of Lear].

The word *opposites* (43), evidently means *opponents*, as is seen still more clearly in line (154)—*an unknown opposite*. The note in the Clarendon Press Edition does not explain this word, but refers us to line 154. We look up line 154, and then find ourselves referred back to line 43. This reminds us of an interesting but long forgotten amusement of our early school days which consisted in writing in some book, 'see page so and so.' On the page thus indicated there was nothing but a reference to some other page, and so on half a dozen times over, till at the end you came upon the words 'You're an ass!'

The words '*it is the privilege of my honours, my oath and my profession*' (130, 1), seem to require some explanation. From the note in the Clarendon Press Edition we learn that the reading *the privilege of my honours* is a sort of compromise between the folios and the quartos. We should have much preferred to be told the exact meaning of the expression; and what it refers to. One guess is as good as another perhaps in a passage of this description, but whoever undertakes to explain it must say what is meant by *my honours*, and, again, what *it* is to which the whole expression refers; in other words, what it is that Edgar calls 'the privilege of my honours.' May we suggest that what Edmund alludes to is the protest or defiance

to which he is giving utterance, and that he alludes to this, with perfect propriety, as the privilege of his honour, his oath, and his profession of knighthood? In other words, none but a knight was allowed to challenge another person in this formal manner. The sense will be made clearer (supposing this explanation to be correct) if after the word profession we understand 'to make this protestation.'

The terrible agony of Lear in the closing scene must tax the actor's energy severely if, like Mrs. Siddons, he throws himself unreservedly into the part. That great actress is said to have spent hours before each representation in the endeavour to realise the character she assumed, so that she was actually, for the time, under the sway of the emotions she depicted. She felt, in fact, pretty much what she pretended to feel. No wonder, then, that her impersonations struck the audience like a reality.

The student who is preparing this play for an Examination is recommended to pay great attention to 'paraphrasing.' Examiners frequently allude to the weakness of candidates in this particular. But anyone who has mastered every expression in the play can surely put it into slightly different words. Many junior candidates seem to consider 'paraphrasing,' as a special accomplishment, and seem not to be aware that it amounts to little more, in most cases, than giving an *explanation* (in the briefest manner) of certain unfamiliar words or expressions.

The sources from which Shakspere drew the material for his story are easily ascertained, and not difficult to remember. They need not be mentioned here, as every edition of the play mentions them in the preface.

The remarks of Coleridge and Schlegel on this play should be studied by senior candidates. Nearly everyone nowadays has access to a library.

We could wish that 'King Lear' were played a little oftener. Londoners have of late years enjoyed the privilege of seeing 'The Tempest,' 'The Merchant of Venice,' and 'As You Like it,' performed just before Christmas. No one could fail to notice the number of boys and girls who were following the play by the aid of a copy of the Clarendon Press Edition. They were candidates for the next ensuing Cambridge Local Examination. Managers of theatres might do worse than enquire what plays are 'set' for the different Examinations that come off about Christmas time. A special performance or two of these plays just before an Examination might attract thousands.

(The end.)

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Alfred Carpenter, Esq., M.D., J.P., &c., &c.

THE readers of this journal are familiar with the name of Dr. Alfred Carpenter. From the beginning his able contributions have occupied the place of honour in these pages. They have been written with special reference to the work of education and in thorough and hearty sympathy with teachers. It is not our intention to make any remarks upon these papers, good wine needs no bush, and articles by Dr. Alfred Carpenter require no praise to draw attention to them.

Dr. Carpenter is an eminent medical man. He has a large practice. He enjoys the confidence and respect of his profession. But he has perhaps more than in any other way distinguished himself as a public spirited citizen. It is highly probable that his eminence as a sanitary reformer is due more to his social instincts than to his love of scientific celebrity. Dr. Carpenter has the health and happiness of the community at heart, and labours with untiring perseverance to reform abuses and introduce new and improved sanitary appliances.

But while aiming at matters so vitally concerned with general health, as fresh air, pure water, perfect drainage and ventilation, Dr. Carpenter has for thirty years past diligently promoted everything that bears directly upon the mental and moral improvement, and the social comfort and amusement of his neighbours. What may be done by the able and sustained effort of a distinguished man is exhibited in the growth of the Croydon Literary Institution. When the Doctor joined it thirty years ago the members were few and the interest displayed in it but small.

The immense energy which the Doctor threw into the Institute resulted in the erection of a building which was sufficient for the requirements of that time, and the members presented a watch to Dr. Carpenter in recognition of the vigour with which he had taken up the cause. The Institute has been a great benefit to the town, and has several times become too small for the demands made upon it, and on each occasion the assistance of the Doctor has been generously offered.

In the early part of this month the Hall was again re-opened after fresh improvements and additions. An opportunity was thus afforded to the inhabitants of Croydon of marking their appreciation of his unceasing exertions on their behalf. A bust has been placed in the Hall as a memento of his personal worth and immense services. An address was also presented to him which he accepted in a graceful modest speech in which the chief credit he took was his effort to expel typhoid fever from the town, which fortunately has been successful.

The address was presented at a delightful Soirée at which most of the leading inhabitants of Croydon were present. We add our best wishes that Dr. Carpenter may long live to enjoy the happy memory of that pleasant evening. He has been a zealous worker in the best of causes, and he has received the hearty thanks of those whom he has benefitted. Dr. Carpenter's work will not be forgotten. We trust his example will be widely followed.

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Publications Received.

Bell, G., and Sons—

Experimental Chemistry. By Stöckhardt and Heaton.

Burns and Oates.—

Introduction to English History.
The Granville Illustrated English. By T. J. Livesey.

Boulton, Joseph, and Co.—

A Summary of English History. By Llewellyn C. Burt

Blackie and Son.—

Our Frank and other Stories. By Amy Walton.
The White Squall. By J. C. Hutcheson.
The Young Carthaginian. By G. A. Henty.
A Final Reckoning. By G. A. Henty.
Down the Snow Stairs. By Alice Corkran.
The Eversley Secrets. By Evelyn E. Green.
Vere Foster's Copy Books. Nos. 10 and 11.
Contributions to the Science of Education. By W. H. Payne, A.M.
Tales of Captivity and Exile.
The Bravest of the Brave. By G. A. Henty.
The Late Miss Hollingford. By Rosa Mulholland.
Dorothy's Dilemma. By Caroline Austin.
Devon Boys. By G. Manville Fenn.
Gordon Browne's Series of Old Fairy Tales: No. 1. Hop-o'-my-Thumb; No. 2. Beauty and the Beast.

Cassell and Co., Limited—

Cassell's Public School French Reader. By G. S. Conrad.

Chambers, W. and R.—

Arithmetic for University Examinations.

Curwen, J., and Sons—

Text Book of Musical Elements. By G. Oakey, Mus. Bac.
The Child Pianist, 1st, 2nd, 3rd, 4th Steps, Grade 1. By J. Spencer Curwen.
Ditto, Teacher's Guide. By Mrs. J. S. Curwen.

Fisher Unwin, T.—

Boys' Own Stories. By Ascott R. Hope.
The Century Magazine, November.

Hodder and Stoughton—

An Angel Guest in Human Guise. By Ruth Lamb.
Aunt Tabitha's Trial. By Lina Orman Cooper.
Strawberry Hill. By Clara Vance.
The Talbury Girls. By Clara Vance.
Uncle Tom's Cabin. By Mrs. H. B. Stowe.
The Prince of the House of David. By Prof. I. H. Ingraham.
When we were Girls together. By Sarah Doudney.
The Master Hand. By Pansy.
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The Bills of Dumbarton. By Lucy L Montgomery.
Eyes to the Blind. By C. Birley.
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On Special Service. By Dr. Gordon Stables.

Johnstone, W. and A.K.—

The Pupil Teachers' Geographical Year Book—Fourth Year (New Series).

Kegan, Paul, Trench and Co.—

The Life of Words. By Arsène Darmesteter.

Longmans and Co.—

Longmans' Magazine, October and November.
White's Grammar School Texts—The Hecuba of Euripides.

Mathew, J. P. and Co.—

Drawing Books. Nos. 1. to 8.

Maybury, A. C.—

How to Pass. No. II.—Homer's Iliad Book XVI. By A. C. Maybury, D.Sc., F.G.S., &c.

Murby, T.—

The Child's Guide to the Prayer Book. By the Rev. Douglas L. Heath.

Murray, John—

Dr. Wm. Smith's French Prose Composition. (Principia).

Philip, G., and Son—

The Intermediate Class Book of Modern Geography. By J. Francon Williams.

Smith, Elder and Co.—

The Cornhill Magazine, October.

Thom, Alex., and Co.—

Thom's New Reading Books (Primers 1 and 2 and Infant Reader).

The Clarendon Press Warehouse.—

Easy Greek Readers. Parts 1 and 2. By Evelyn Abbott, M.A., LL.D.
Euclid Revised, Book I. } By R. C. I. Nixon,
Euclid Revised Books, I. and II. } M.A.
Selected Odes of Horace. Vol. I. Text. Vol. II. Notes. By E. C. Wickham, M.A.

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The 'Practical Teacher' Sale and Exchange Column.

Owing to numerous requests, we have been induced to start this Exchange Column for the benefit of our readers. We shall be glad to insert announcements relating to the 'Sale or Exchange' of books, etc., at the rate of ONE PENNY PER LINE, *prepaid.*

A Teacher wishes to dispose of the following books in good condition by sale for which offers are requested:—

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What offers? Anything reasonable accepted! Mr. John James Francis, 9, Kimberley Road, Falmouth.

What offers? 10 2s. parts of Cassell and Co's Illustrated Science for All.—E. Lester, 32, Denmark St., Gateshead.

What offers? Knowledge, Vols. VII. and VIII., Boy's Own Paper, Vol. II., and Cassell's History of the War in the Soudan, 15 2s. Parts, just finished, all unbound.—Address G. H. Elwick, Broadgate, Lincoln.

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demned to draw a picture, as an imposition; this picture shows so much talent that it is carefully preserved and the master obtains permission for the lad to be properly taught drawing.

A lady and an only daughter come to live next door, and they help to refine the lad and to fit him for that position to which he is proved to be entitled.

As we said at first, the story is almost perfect, and ought to do much good.

(15) **The Prince of the House of David.** By the Rev. Professor J. H. Ingraham.

We have known this book for many years and dislike it immensely. That it may tell most graphically the story of the ministry and death of Jesus we cannot deny, but His story is far too solemn to be mixed with fiction, and many of our Lord's most beautiful and valuable sayings are spoilt by imaginary explanations which are added as being said by Him.

(16) **Uncle Tom's Cabin.** By Harriet Beecher Stowe.

This reprint calls for no remark. Many and many a year must pass before the English reading public will tire of this marvellous work.

Civil Service Book-keeping. By G. E. Skerry, F.S.Sc., and Ernest Jonas, Inter. B.A. The Civil Service College.

Both these gentlemen are connected with the Civil Service and of course know exactly what is required by the Examiners, and this no doubt is given here in a cheap and comprehensive form. There are, too, all the Examination Papers set on the subject for the last eight years, given in full, which papers, twenty-eight in number, occupy more than half the book.

Previous to these papers there are a few pages of questions and answers and some exercises carefully graduated, of which a key is being prepared. The definitions are collected at the beginning of the volume.

Without for one moment saying that we believe it to be any better than the many other manuals on the same subject we have lately noticed, we should think it would suit those students very well, who wanted to prepare themselves for the examinations for which it is especially prepared.

Practical Papers in Higher Arithmetic. Part I. By E. W. Jonas, Inter. B.A. Edited by Geo. E. Skerry, F.S. Sc. Sheppard and St. John.

This is an expensive little pamphlet of 44 pages, divided into eight chapters on such subjects as Scales of Notation, Clock Questions, Combinations of Ratios, &c., the 9th chapter being the paper set at an examination for men clerkships, January, 1886, fully worked out.

The first chapter struck us as the best, but even in that we should doubt if a student, if he had had no other help, would be able to give a good account of why he does this or that.

There are no examples for practice, but a few fully worked out in every chapter, with more or less explanation, but than some of the methods employed, we venture to think there are better ones both known and published.

Messrs. Blackie's List.

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The following volumes are got up in Messrs. Blackie's usual style, being exquisite specimens of clear printing and ornamental binding.

(1) **The Young Carthaginian.** By G. A. Henty.

Mr. Henty, in his preface, tells us that the *raison d' être* of this work is the desire to correct the ordinary school boy's strong sympathy with Carthage as against Rome. He believes that though it is natural for us all, maybe, to sympathize with the weaker, whether nations or individuals, still our feelings ought to go with Rome as the nobler of the two rivals for universal sovereignty. He compares the elevation of those conquered by Rome with the degradation of those conquered by Carthage, and though he often influences our judgment, we doubt if he will carry with him the hearts of the majority of school boys, who will still grieve over the failure of the great Hannibal.

The hero of this story is a cousin of Hannibal's, being a son of Hamilcar, who joins Hannibal in Spain, and who is with him at Saguntum, at Cannæ, and many other places. The young officer is served by a faithful old Arab, whose devotion is beautifully told.

We should recommend parents whose sons are just going to begin Livy to get them this volume as a study, for it would be invaluable to them in reading the story as given by the old historian.

(2) **A Final Reckoning.** By the same Author.

Our author almost asks permission of his young readers to leave for a spell the regions of history and to give them a story, in which the actors are more the creation of his own imagination.

It were hard to grudge one, who has done so much to popularize history, such a relaxation, but we are bound to say Mr. Henty does not shine in this class of literature as much as he does in that, of which he is the best, if not the sole, exponent.

The latter two-thirds of this book tells us of the hero's doings as an Australian policeman, which enables the author to give us sketches of colonial life, as it existed some years back, before that cruel practice of sending our convicts thither had been abandoned.

The circumstances which lead to the hero's emigration are somewhat conventional. We have the two school boys—the good, or at least the truthful, and the bad. The former is, during a course of some five or six years, two or three times suspected of doing that which has been done by the other, and for the last of these suspicions he nearly loses his liberty. All is eventually properly cleared up—the good being triumphant, and the bad duly punished. A young lady, who has done our hero good service as a child, turns up at the right time, and all ends happily.

Mr. Henty can write nothing which does not inspire his young readers with a desire to be truthful, industrious, and honest—and this volume will do this, even though it may not teach history.

(3) **The Bravest of the Brave.** By the same Author.

This is a story of the Expedition to Spain under the Earl of Peterborough, which took place in the first decade of the eighteenth century.

The story circles round an orphan nephew of the mayor of Southampton, who is impressed, at the early age of 16, for military service, according to the cruel custom of the day. He distinguishes himself, and leaving the army as a colonel represents Southampton for many years in Parliament.

As the author says in his preface, the Expedition is one little studied and little known, and doubtless it is well worth being drawn from obscurity and thus made familiar to our rising generation in this welcome fashion.

(4) **The White Squall.** By John C. Hutcheson.

As long as Messrs. Blackie can secure the work of two such writers for boys as Messrs. Henty and Hutcheson, there is no fear of their Christmas parcel lacking interest—or of their hands being idle.

This is a tale of the Sargasso—the word Sargasso being carefully explained and derived—Sea, and is told in Mr. Hutcheson's best style, being the self-told account of a

young lad who goes to England to school in a sailing vessel which is caught in a white squall, and thereby partially wrecked, the boy being saved by a faithful old negro who had followed the ship and got pulled on board.

The book is interspersed with useful little diversions of a scientific nature, that any lad reading it will by no means have only read a prettily told story.

(5) Our Frank, and other Stories. By Amy Watson.

This is a collection of six short stories, the last five being only of some ten or fifteen pages each, the story named on the title page occupying the remaining half of the little volume.

Frank, the hero of the first story, being considerably thrashed at home, tries his fortunes elsewhere by running away, but not faring much, if at all, better in the one case than the other, wisely returns home, to the delight of all concerned, to whom his flight is supposed to have done more good than harm.

The other stories call for no notice.

(6) The Eversley Secrets. By Evelyn Everett Green.

We can well believe this story may do a great deal of good with boys or girls who are not in perfect sympathy with their parents, and allow themselves to do that which they know their fathers or mothers would not approve.

As far as we know, the main idea of this story is a perfectly new departure. A little lad, who, having been brought up by his grandmother, has higher tastes and more advanced notions than his brothers and sisters, is begged by his mother, who leaves her family for some three months, to try to help his eldest brother. A strange commission, but one the little fellow tries to carry out, and gets himself into all sorts of troubles by so doing, being misunderstood on the one hand, and persecuted on the other.

The story is of considerable interest, and arrests the attention from the beginning to the end.

(7) Down the Snow Stairs. By Alice Corkran.

The idea of this book is somewhat borrowed from the immortal Alice in Wonderland.

It would be manifestly unfair to compare it with so happy an effort as that, either as to its letterpress or illustrations—good as these, by Gordon Browne, are.

The heroine of this story is more amongst possible mortals than Alice was, and we are bound to say that we like her better when with her fellows than when with her fairies.

(8) Dorothy's Dilemma. By Caroline Austin.

Whatever harm Charles Stuart may have done to his subjects, and however nobly he may have died, which in the minds of many men fully atoned for all his weaknesses and vacillations; there is no doubt his sad history reveals more points around which there lies a romance than that of any other historical personage, king or otherwise.

Dorothy, a mere child, is persuaded by a boy, a few years older, to open her father's doors to the poor King, who is flying from his enemies, the father being a staunch Roundhead. They hide him for a few hours and then set him on his way, but not before her brother has found it out. At first overawed by the majesty of Charles' manner, this brother dares do nothing, and lets him depart without arousing the neighbourhood, but eventually he follows him and raises a small crowd of labourers to stop him; they too are so impressed by his royal demeanour, that they kneel to be blessed instead of lifting a finger to stop him. We will follow the story no further, but only congratulate the authoress in the way in which she has told it; assuring our readers that it will interest all, old and young alike.

(9) The Late Miss Hollingford. By Rosa Mulholland.

This is a reprint of a book, which first saw the light under the auspices of the great Charles Dickens. The manuscript was submitted to him as editor of *All the Year Round*. His clear brain at once acknowledged its power, and gladly accepted it for his magazine. The volume too had the honour of being bound up in the Tauchnitz edition with *No Thoroughfare*, and this too by Dickens own choice.

We need only add that we think the story, both in its construction and point of style, is well worthy of such honour, and that we think Messrs. Blackie have done well to introduce it to the rising generation.

(10) Tales of Captivity and Exile.

This is a collection of the accounts of thrilling and startling imprisonments and escapes which have actually taken place.

The first chapter contains the account of no less than 19 of such narratives, beginning with Hegisistratus of Elea, as recorded by Herodotus, and concluding with the well known story of the Man with the Iron Mask. We then have four stories of the Exiles of Siberia, including that of Elizabeth Zopouloff.

Lastly, there are some seven longer accounts of more recent events, such as of Masers de Latude in the Bastile, and of Napoleon at St. Helena.

The editor has done his work well, and boys who prefer facts to fiction will welcome the volume gladly.

(11) Devon Boys. By George Manville Fenn.

This is a story of three Devon lads of different characters and temperaments, supposed to be told by one, who is certainly the most lovable of the three.

They go through all sorts of adventures, which their lovely country renders possible and probable.

No one knows better than Mr. Fenn how to describe such scenes, and moreover, how to introduce valuable and reliable information on all sorts of subjects which boys ought to know.

We only wish we had more room at our disposal, to do the work the justice it deserves.

(12) Hop o' my Thumb. Retold by Laura E. Richards. Illustrated by Gordon Browne.

(13) Beauty and the Beast. By the same Author and Illustrator.

Though Mr. Gordon Browne's name appears on the title page of several of Messrs. Blackie's publications noticed above, we have not thought it necessary to say anything about them.

In books of this class, however, which are practically picture books for very young children, more than half the battle is the way in which the illustrator does his work.

At the present time, no doubt, owing to the lamented death of Randolph Caldecott, there is room for such work as is presented here, but we are obliged to add poor Caldecott's successor has not yet turned up in Mr. Gordon Browne, though some of his work is not lacking in talent, especially in some of the smaller pictures, and the latter of the two tales is a distinct advance upon the former.

We like the letterpress almost better than the pictures, none of which, by the way, are coloured.

The Story of the Nations; Rome. By Arthur Gilman, M.A. T. Fisher Unwin.

We cannot quite make out for what class of readers the author intends this Story of Rome. Sometimes his style is almost that of a woman telling a tale to little children; at other times he leaves his narrative to give valuable deductions, such as readers of maturer years, who know the story as well as he, would gladly study.

In the earlier parts he follows the lead of such illustrious writers as Livy and Milton, and gives the accepted myths without stopping to enquire how much of them may be founded on fact, and how much may be the outcome of the poet's imagination.

The volume carries its readers down to the period just before the Empire, but in some of the sketches of the habits of the Romans, we fancy the author has given us a development which had scarcely shown itself till times a little later.

We were particularly struck with the lucid way in which Mr. Gilman shows the state of parties in Cicero and Cæsar's time. Were we preparing a class book of some Latin author which treated of this critical period in Roman History, we should like to borrow this chapter, almost in its entirety, as an introduction.

The book might be used as a class book, and as such, boys and girls would welcome it as a great improvement on the more scholastically prepared history, but whether they will read it as a story book we have our doubts.

We notice Mr. Gilman, at times, uses Shakespeare's language in describing some of the scenes.

There are a few illustrations, but their value would be enhanced if their origin were mentioned, *e.g.*, there is a representation of a bust of Hannibal, and of one of Terence, as well as of others, but we are not told whether these busts are antiques, or if so, where they are preserved. Then there are pictures of the 'Triumph of a Roman General,' of 'Gladiators at a Funeral,' and one styled 'In a Roman Study,' but their origin is not given. The sketch, too, of a Roman mile stone is very truthful looking with its partially effaced inscription, but a line or two as to its original whereabouts and its present home, if it be still in existence, would increase the value of the picture tenfold.

As far as we noticed, all the dates given in the volume are referred to the Christian Era, but at times the B.C. is omitted, and at so critical a period as 370 B.C. the dates might be referred to the foundation of the city.

We do not wish to be hypercritical, but if these volumes are to take the place they deserve, too much care cannot be bestowed on these trifles.

We noticed a most valuable appendix in the form of a copious index. As we said when noticing Germany, we anxiously await others of this series, which we believe will be a most valuable addition to the popular historical literature of the day.

The City Youth. By J. Thain Davidson, D.D. Hodder and Stoughton.

Dr. Davidson is evidently one who takes a deep interest in what is perhaps the most interesting class of mankind, viz., youths just entering on the duties of life, when the paternal authority is loosening, and when they have to begin to choose and judge for themselves to their own weal or woe.

We wish every young man that ever comes to this or any other big city, would read and ponder over the weighty advice and warning here given so wisely and so well.

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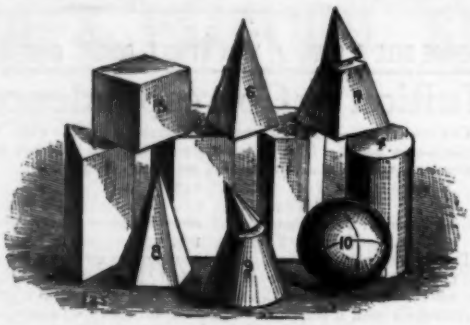

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